UNION OF SOUTH AFRICA

DEPARTMENT OF AGRICULTURE

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JULY, 1922.

DEPARTMENTAL NOTICES.

STOCK SALES.

The annual sale of Government pedigree stock at the School of Agriculture, Elsenburg Mulders Vlei, will take place on *Wednesday, 11th October*, 1922.

The stock to be offered consists of—

Cattle.—Friesland: About 6 bulls. Jersey: About 2 bulls and 1 cow.

Sheep.—Suffolk Down: About 10 rams. Murray Merino: About 8 rams and 25 ewes.

Pigs.—Large Black: About 5 boars and 15 sows. Berkshire: About 5 boars and 6 sows.

Poultry.—A number of pens of pure-bred poultry.

All animals offered for sale have been submitted to the tuberculin test and have not reacted.

Animals sold will not be conveyed to destination at the expense of the Department.

No animal sold may be exported from the Union within two years from the date of purchase.

For catalogue, and further particulars, application should be made to the Principal at above address.

ANNUAL SALES OF STOCK

Will also be held as usual at—

POTCHEFSTROOM: About beginning September.

GROOTFONTEIN, Middelburg, Cape Province: About 15th September.

Full particulars of the animals to be offered at these sales are not yet available, but will be published later.

ORANGE FREE STATE SCHOLARSHIPS FOR AGRICULTURAL STUDY.

Applications are hereby invited in respect of four scholarships being offered under Orange River Colony Act No. 34, 1909, for the following subjects: Animal Husbandry, Tobacco and Cotton, Agricultural Economics.

These scholarships are only available for children of the inhabitants of the Orange Free State, and evidence of parentage should be submitted accordingly with the application.

Applicants must at least have passed the University Matriculation, and should furnish certificates of conduct, health, date of birth, and educational qualifications, and state whether bilingual.

Applications should be received not later than 15th July, 1922, by the Secretary for Agriculture, Pretoria, from whom further particulars may be obtained.

SPECIAL COURSE IN POULTRY.

A Special Course in Poultry-keeping of five months' duration will be held at the School of Agriculture, Glen, Orange Free State, commencing on 24th July, 1922.

The course will be open to both men and women.

Terms: £25 for the course (tuition, board, lodging, washing, and ordinary medical attendance inclusive).

Further particulars may be obtained from the Principal at above address.

GOVERNMENT TRAINING FARM, GUBA PARK, INDWE, CAPE PROVINCE.

There are several vacancies for students at the above farm. Application for admission and particulars should be made to the Advisory Officer for Agricultural Settlers, 71 Parliament Street, Capetown.

The course is of a purely practical nature and lasts twelve months. It is free to inhabitants of the Union, but overseas students (if accommodation for them is available) are charged £50, which is refunded if the student completes the course satisfactorily and subsequently settles on the land in the Union.

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AUGUST, 1922.

DEPARTMENTAL NOTICES.

ANNUAL SALES OF GOVERNMENT PEDIGREE STOCK AT SCHOOLS OF AGRICULTURE.

Provisional notice is hereby given that the Annual Sales of Government Pedigree Stock will be held as usual at the undermentioned Schools of Agriculture:—

Potchefstroom: 3rd October, 1922.

Grootfontein, Middelburg, Cape Province: 15th September, 1922.

Glen, Orange Free State: 22nd September, 1922.

Elsenburg, Mulders Vlei: 11th October, 1922.

The catalogues are now in course of preparation, and definite particulars will be published later. All inquiries should be addressed direct to the Principals at the respective institutions.

Animals sold will *not* be conveyed to destination at the expense of the Department.

All cattle offered for sale have been submitted to the tuberculin test and have not reacted.

No animal purchased at these sales is allowed to be exported from the Union within two years from date of purchase.

FARM ASSISTANTS AVAILABLE FOR EMPLOYMENT.

From the end of July onwards, students at the Government Training Farms at Guba Park, Indwe, and at Beginsel, Standerton, will be completing their one year's course of instruction. A proportion of these men, who are upwards of seventeen years of age and of good character, are anxious to find employment on farms at the expiration of their training. As they have received a thoroughly practical training, it is confidently anticipated they will prove competent assistants or overseers, and any one who can find employment for one is requested to communicate with the Superintendent at one or other of the institutions, who will be pleased to supply full particulars

SPECIAL COURSE IN FACTORY DAIRYING

At School of Agriculture, Glen, Orange Free State, from 11th October, 1922, to 30th September, 1923.

This course is designed to equip men for responsible positions in Creameries and Cheese Factories. Fees (including tuition, board, lodging, laundry, and ordinary medical attendance), £50. For full particulars apply to the Principal.

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SEPTEMBER, 1922.

DEPARTMENTAL NOTICES.

ANNUAL SALES OF GOVERNMENT PEDIGREE STOCK AT SCHOOLS OF AGRICULTURE.

These will be held this year as usual at the undermentioned Schools of Agriculture:—

Grootfontein, Middelburg, Cape Province: 15th September, 1922

Glen, Orange Free State: 22nd September, 1922.

Potchefstroom: 4th October, 1922.

Elsenburg, Mulders Vlei: 11th October, 1922

The catalogues are now in course of preparation, and all applications for copies thereof and further particulars should be addressed direct to the Principals at the respective institutions.

Animals sold will *not* be conveyed to destination at the expense of the Department.

All cattle offered for sale have been submitted to the tuberculin test and have not reacted.

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FARM ASSISTANTS AVAILABLE FOR EMPLOYMENT

A number of students have completed their course of practical training at the Guba Park Training Farm, Indwe, and are open to offers for employment as farm assistants, overseers, etc.

Application should be made direct to the Superintendent, Guba Park Training Farm, Indwe.

SPINELESS CACTUS LEAVES FOR SALE.

The School of Agriculture, Potchefstroom, has a large number of spineless cactus leaves for sale of the following varieties: Anacantha, California, Fresno, Hardybred, Korfu, Malta, Mayers, Sonoma.

Prices are as follows:—

3d. per leaf up to 100 leaves (carriage forward).

2½d. per leaf from 100 leaves to 500 leaves (carriage forward).

3d. per leaf up to 100 leaves (carriage forward).

A few leaves each of several other varieties will be supplied, free of charge, on a co-operative basis to farmers who wish to try them, and who will furnish a report on the result.

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OCTOBER, 1922.

DEPARTMENTAL NOTICES.

SCHOOLS OF AGRICULTURE.

OPENING OF 1923 SESSION.

The next diploma courses at the Schools of Agriculture will commence in January, 1923.

Present fees (including board, lodging, tuition, laundry, and ordinary medical attendance) are £50 per annum, payable quarterly in advance. Candidates should be at least 16 years old, and should have passed the Junior Certificate or its equivalent.

It is strongly recommended that those who have not had experience of farm life and work should acquire a practical knowledge of farming operations before entering the diploma course.

The complete and thorough character of the instruction offered in agriculture and agricultural science, and the valuable practical training given, are now well known. The education of the young farmers of the future should not be regarded as complete without a course at one of the agricultural schools. Apart from its value in agricultural pursuits, it provides an excellent general education.

Applications, accompanied by satisfactory references as to character and evidence of good health, should be made to the respective principals. The names and addresses of the institutions are—

Elsenburg, Mulders Vlei, Cape Province.
Grootfontein, Middelburg, Cape Province.
Glen, Orange Free State.
Potchefstroom, Transvaal.
Cedara, Natal.

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Prices are as follows:—

3d. per leaf up to 100 leaves (carriage forward).
2½d. per leaf from 100 leaves to 500 leaves (carriage forward).
2d. per leaf over 500 leaves (carriage forward).

A few leaves each of several other varieties will be supplied, free of charge, on a co-operative basis to farmers who wish to try them, and who will furnish a report on the result.

SPECIAL COURSE IN OSTRICHES.

Grootfontein School of Agriculture, Middelburg, Cape Province.

A Special Course in Ostrich Farming will be held at the above institution commencing early in October, and extending over a period of two months.

The course will comprise: Breeding, Chick Rearing, Feeding, and the Clipping, Judging, and Marketing of Feathers, etc.

Fees (inclusive of board and lodging): £10.

Reduced railway fares at single rate for return journey will be granted.

Further particulars and forms of application may be obtained from the Principal.

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NOVEMBER, 1922.

DEPARTMENTAL NOTICE.

SPINELESS CACTUS FOR SALE AT GROOTFONTEIN SCHOOL OF AGRICULTURE, MIDDELBURG, CAPE PROVINCE.

The undermentioned varieties of Spineless Cactus are available for disposal at the School of Agriculture, Grootfontein, Middelburg, Cape Province:—

Variety.	*Quantity.*
Ficus Indica	Unlimited
Miskatel	500
Algerian	500
Morado	500
Fusicaulis	500
Protectorate	50
Chico	50
Meyers	200
Korfu	200
Hardybred	200
Quyaquiz	200
Fresno	200

The smallest number sold to one buyer is 10 leaves. Prices are as follows:—

3d. per leaf from 10 to 100;
2½d. per leaf from 100 to 500;
2d. per leaf over 500,

with the exception of "Fusicaulis" and "Protectorate," for which a charge of 6d. and 1s. per leaf respectively is made.

Applications for supplies should be addressed immediately to the Principal direct.

GOVERNMENT GUANO ISLANDS.

The Capetown offices of the above Division having been transferred to new quarters, it is notified that, as from 1st November, 1922, the following will be the new address:—

SUPERINTENDENT, GOVERNMENT GUANO ISLANDS,
MALAGAS BUILDING, BREE STREET,
CORNER DOCK ROAD, CAPETOWN.

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DECEMBER, 1922.

ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE

FOR THE

YEAR ENDED 30TH JUNE, 1922.

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DAIRY SHORTHORN COWS AT CEDARA. WILD QUEEN 29th AND WILD QUEEN 28th. FULL SISTERS.

JOURNAL OF THE DEPARTMENT OF AGRICULTURE.

VOL. V. JULY, 1922. No. 1.

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NOTES.

Problems of the Farmer.

The farmer naturally looks to the Department for advice on matters concerning his crops, live stock, etc., and many letters are daily received from all parts of the Union, which reflect the problems of the day, and which are attended to by the various officers versed in the subjects in question. The Department welcomes correspondence of this nature: for the vastness of the country makes it impossible for the limited number of available officers to get in frequent direct touch with every farmer for the purpose of advising him on the many matters necessary to his progress. It does expect, however, that through the medium of its chief mouthpiece, the *Journal*, farmers in the earnest prosecution of their industry will accept the means thus offered of keeping in touch with the work of the Department charged with the furtherance of their interests. In order, therefore, to enable farmers to benefit by the advice that is given to others concerned perhaps with similar problems, a section in future issues of the *Journal* will be set aside for publishing inquiries made by farmers throughout the Union, together with the Department's replies thereto. These inquiries will be selected from those considered to be of the most general interest, and will cover a wide range of subjects. Both question and answer will be given in a concise form. By this means it is hoped to make available seasonable advice in a form that can readily be absorbed, and the Department trusts that farmers generally will make use of and benefit by the specially selected information that will thus be provided.

Controlling Co-operative Effort.

The days of individualistic and nomadic farming are past, and the progress of the years, hastened by the economic upheaval that has recently shaken the world, has brought at the present time to South Africa the recognition of the co-operative principle, that foundation of mutual trust from which our future prosperity will advance with accelerated speed. Farmers have unmistakably wakened to the need of organizing their business, and anxious now to secure the benefits that co-operative effort offers them, are moving in a direction that will lead to the formation of numerous co-operative bodies throughout the Union. The Government is fostering a movement fraught with so much of moment to the agricultural development of the country, and a legislative measure designed to this end is now before Parliament. But co-operative effort may be hampered by a multiplicity of bodies having, indeed, similar objects but working independently. This has been seen by far-sighted leaders of the movement, and representatives of various co-operative and other agricultural bodies came together last January at De Aar with the object of reconciling the work of the various bodies and bringing about, if not an amalgamation, then at least a federal organization. Following this a further meeting took place at Bloemfontein in February (attended by representatives of certain sections only), after which, on the suggestion of the Secretary for Agriculture negotiations ensued between the South African Agricultural Union and other organizations regarding the next steps to be taken in furtherance of this very important object. As a result a special conference under the auspices of the Union referred to met at Johannesburg last April to devise a scheme that would ensure the cohesion of the co-operative bodies already in existence and provide for those of the future. The aim was to prevent the formation of bodies with similar objects working independently: such, it was felt, could only be attained by providing at the outset a scheme of cohesion among all present bodies and of definite spheres for each, or for all to work under a central authority.

The Johannesburg conference advanced the matter a stage further. At it the disability of sectional organization only, as at present, and the advantages of some form of central control, were discussed at length. It was expressed that this central organization should be essentially of a business nature, and its functions should include important duties concerning the oversea market, railway and sea freights, insurance, etc. Finally, it was decided that steps should be taken with all expedition to form what was termed the "Central Federal Board," which would be representative of co-operative institutions, and arrangements were made for a fully representative meeting at Bloemfontein, on the 31st May, for the purpose of drafting a constitution for the proposed Board. It was also decided to request the South African Agricultural Union (the executive of which forms the South African Agricultural Advisory Board) to modify and alter its constitution in order to allow the proposed Central Federal Board to be represented, when constituted, on the Advisory Board.

The meeting at Bloemfontein took place as arranged, when, according to advice received, the constitution was duly discussed

and drafted for the purpose first of submitting it for consideration to all bodies concerned; thereafter it is to be finally deliberated upon by a conference composed of such bodies, the meeting to be arranged by the South African Agricultural Union.

The Profitable Dairy Cow.

To those who have not seen it we would recommend a perusal of the article that appeared in the May, 1922, issue of the *Journal* entitled "The Dairy Industry in South Africa," together with that very useful supplement, contained in the same issue, "The Feeding and Management of Dairy Cattle." At the present stage in the undoubted onward movement of dairy farming in this country, when farmers are realizing the need ot business-like co-operation in reducing costs of production to a minimum and when prevailing prices call for the utmost discrimination between the profitable cow and the one that does not or has ceased to pay, it is imperative that dairy farmers should avail themselves of the advice that the Department is able to impart in the furtherance of their interests. Following, therefore, the articles referred to above, there is published in this issue one by Mr. Van Foreest, the Live Stock Officer of the Department, dealing with the points of the dairy cow and the qualities to be sought in selecting the one that is likely to give a good return. The three qualities emphasized by Mr. Van Foreest as essential in a good dairy cow are, first, constitution, the ability to thrive under her local conditions; second, the production, given a good sire, over a period of years of calves of merit; and, third, a good milk yield. The writer of the article has had considerable experience, and the various points which he sets out should be borne in mind by present and prospective dairy farmers. In this connection farmers will find the keeping of records and testing of their cows, for the purpose of ascertaining the annual production of milk and butter-fat of each cow, an invaluable practice. By this means the poor and unprofitable cow can be detected and removed from the herd, so that the future herd will be built up from the progeny of cows that give a large yield of milk rich in fat. This practice originated thirty years ago in Denmark, and has proved of such benefit that it is now carried out in all parts of the world where dairying is looked upon as an important industry. In the Union it has made gratifying progress. Inaugurated under the Friesland Cattle Breeders' Association, the milk record scheme to-day is recognized by all pure-bred herds, irrespective of any particular breed. The work of supervizing the taking of milk records of pure-bred herds in the Union is carried out by the Dairy Division of the Department, from which full particulars may be obtained.

The need for expanding our markets for dairy produce, and in the prosecution thereof the competition that is to be encountered from other countries well versed in the art of the industry, demand the application of modern and business-like methods on the part of the Union's dairy farmers. Looking ahead also to the possibilities of an export trade in dairy cows, breeders are advised of the necessity of possessing official records of their animals. The future holds much promise, and with the assistance that the Department is able to render, combined with the intelligent labour of dairy farmers, the dairy industry may yet become pre-eminent in South Africa.

The Sale of South African Bred Frieslands.

Since writing the above, advice has been received of the signal success of the sale of South African bred Friesland cattle in England on the 8th June. Being the first of its kind, the export of this consignment of cattle from the Union is in itself an epoch, and the gratifying result of the sale gives it added prominence. The total sum realized was £103,152, an average for the 81 lots of £1273. The highest price, £4515, was paid for a two-year-old heifer; the top price for a bull was £4095, and for a heifer of 5 months £1837. 10s. was paid. It is very satisfactory to know that pure-bred cattle of South Africa can command such large prices in meeting the need of English breeders for new blood, and it augurs well also for future dairy development in the Union that the country already possesses foundation live stock of such high standard.

South African Onions: Trial Shipments.

Two trial consignments of onions were shipped early this year from the Union in order to test the London market. The larger consignment, one of 120 cases and crates, reached Covent Garden market on the 4th April and, according to a report by the Trade Commissioner, were of good quality and arrived in a satisfactory condition. Irregularity in size was the only defect, some being fine specimens but others very small, which entailed resorting. The principal package used was the standard orange box which appeared to be suitable and handy; the crates, however, were too bulky and heavy. The other shipment consisting of 20 boxes arrived on the 28th February, the package used being that usually employed for pineapples, and here also the onions were ungraded.

The latter shipment arrived at a time when supplies were short, and realized 16s. per case of 50 lb., but the April consignment was not so fortunate as in the meantime very large supplies of Egyptian onions had come on the market and prices declined. However, small cases weighing from 50 to 56 lb. fetched from 8s. to 10s., and a few 12s., the crates making from 25s. to 30s.

The future prospects for this trade, says the Trade Commissioner, are to some extent problematical and depend entirely upon the crop conditions of the season. For instance, during the past year there was a general shortage of onions in Europe, and supplies from Spain finished very early while the Egyptian supply was late. There was, therefore, a good market for onions during January and February last, a period when in a normal season the market would be catered for by Spanish supplies. It seems, therefore, that shipments from the Union should reach the market during the above months and not later, although some competition from Spanish supplies might be encountered in a normal season. But the season of the latter would then be closing, and the fresh South African product should be sold at remunerative prices. It is a matter where advice would be needed from oversea early in the season as to the most opportune time to send forward supplies from the Union. In making future consignments, Mr. Canham recommends that they should be graded into three grades, viz.: first, large; second, medium; and third, small.

The Market Oversea for Ground-nuts.

Among the agricultural industries of the Union that have in recent years progressed to a stage where local consumption cannot cope with the supply is the growing of ground-nuts (peanuts or monkey-nuts), and producers to-day are engaged in ways and means for the disposal of their crop. In this connection reference was made in the February, 1922, issue of the *Journal* to the scope offered by the European market for the sale of the South African product and of the large quantities of ground-nuts imported into Europe every year. Since then matters have progressed, railway rates have been reduced, and the value of the industry has come prominently before the community. The question of export is of paramount importance, and an oversea trade has yet to be begun. We are only in the experimental and pioneer days of a possible large industry, and of our first efforts to gauge the value of our product mention must be made of two sample bags of shelled and unshelled "Virginian Bunch" ground-nuts forwarded by the Naboomspruit Farmers' Association to the Trade Commissioner, London. A portion of these samples was sent to the Hull Oil Manufacturing Company, Limited, Hull, who made a very careful test of it, and their report, recently received, is most favourable. They state that the sample of decorticated nuts is an exceedingly fine one, and superior to anything that has yet been placed before them, being considered indeed superior to first-grade Chinese ground-nuts used only for edible and confectionery purposes. Tested as to oil content, the decorticated sample gave 46.06 per cent., with the free fatty acid in the oil at 0.24 per cent., it being the opinion of the company that the oil extracted was of a very high quality, and that though it would not fetch a higher price on the open market than the ordinary oil of commerce as made from the dry Indian decorticated nuts, or the West African undecorticated and decorticated, it would, on account of its lowness in free fatty acid, sell more readily. The oil test gave 1 per cent. more than Indian dry decorticated or the Nigerian decorticated, and the value, therefore, of the South African sample for oil crushing or extraction purposes was placed at from 5s. to 7s. per ton more than Indian ground-nut kernels, which at that time were fetching £24 per ton c.i.f. United Kingdom ports in bags.

The sample of undecorticated nuts was also reported to be exceedingly fine in appearance. The oil test showed 32.93 per cent., and the free fatty acid in the oil about normal, namely 0.46 per cent. The oil test showing 2 per cent. lower than West African undecorticated, it was estimated that the value of the South African article would be about 14s. to 15s. lower than that of the Gambia or Refisque ground-nuts which were then fetching about £18 per ton to the United Kingdom and rather more to Continental ports.

Commenting further on the samples sent to them, the company expressed the opinion that these ground-nuts were of such a high quality that they would readily be bought by the confectionery and fruit trade, and for this purpose would realize higher prices than for crushing or extraction. In China, it may be mentioned, the practice is to hand-pick the ground-nuts, reserving the better ones for the confectionery trade, and selling the remainder as second-grade to local mills for crushing.

A Process for Pressing and Baling Ground-nuts.

In considering the question of the export oversea of South African ground-nuts, the matter of packing is an important one, and farmers interested are advised of a new process, the patent rights of which are held by the Hull Oil Manufacturing Company, Limited, the same company furnishing the favourable report on the sample of South African ground-nuts referred to elsewhere in these notes. Among the advantages of this process is, of course, the great economy in space, the volume of a bale of ground-nuts being reduced from $10\frac{7}{8}$ to $4\frac{5}{6}$ cubic feet, dependent on the origin and dryness of the nuts; the weight of such a bale would be from 185 to 215 lb. In comparison with decorticated nuts, the baled nuts are said to have a slight advantage as regards space in relation to weight; in other words, a ton of decorticated nuts requires about 62 cubic feet, while nuts pressed under the new process would occupy only 56 cubic feet, or 6 feet greater than the space required to carry one ton weight of maize.

This method of pressing, it is stated, will generally be welcomed by manufacturers. In addition to shipping and railage considerations the process is said to serve as a preservative by excluding air from the bale, and the presence of the shell itself not only accelerates, but lowers the cost of the expression or extraction of the oil. The process is arousing a good deal of interest, and the Trade Commissioner, who is keeping in touch with the owners, states that several West African firms which ship large quantities of nuts in their shells to the United Kingdom and France, are now negotiating for a supply of the presses.

Potato Culture in the Union.

Of the crops produced in the Union potatoes rank third in bulk, maize, according to the 1919-20 Census, being first and wheat second. Although the climate of the Union as a whole is not well suited to the production of potatoes, the greater portion being grown as a summer crop on dry lands, they do exceedingly well in some areas, but expansion is limited to the extent of the local market, which, together with exports to adjoining territories in Southern Africa, constitutes at present the sole outlet for the crop. Nevertheless the part the vegetable plays in the daily regimen of the community provides a regular demand, and the crop is grown extensively in favoured localities. In view of requests for information dealing generally with the cultivation of potatoes, Mr. Bosman, Technical Assistant of the Department, has contributed to this number of the *Journal* an article on the subject which will be found useful by those engaged in, or who propose to take up, the growing of the crop. There are certain essentials, such as the quality of the seed sown and the preparation of the seed-bed, that must be properly carried out in order to ensure success, and these, based in a large measure on the results of experiments, are dealt with by the writer. The present one is to be followed in subsequent issues of the *Journal* by articles dealing with the insect and other pests to which potatoes are subject, so that combined they will serve as a useful guide to growers.

Rodents and Plague: A Menace to Agriculture.

Farmers, and especially those in the districts of the Orange Free State where plague now prevails, are warned of the serious consequences to their farming operations that may result from a spread of the disease. In such event it may be necessary to hold up farm produce, and prevent the export of mealies, etc., from the infected areas. The disease is primarily a rat disease, and infection is carried from rat to man by fleas. There is serious danger of spread of the disease by sick and dead rats in broken maize bags, forage, etc., and the Department of Public Health has been carrying on an active campaign against rodents, finding plague-infected rats on many farms and railway stations in the Bothaville, Kroonstad, Hoopstad, and Winburg Districts. It is very important therefore that farmers should co-operate with the Public Health Department in their efforts to prevent the spread of the disease, for depending on the success of the campaign is the question of prohibiting the movement of agricultural produce out of the infected districts. Not only as carriers of plague, but as destroyers of produce, rats and mice are a serious menace, and farmers throughout the country should keep their farms clear of them.

For the information of farmers in the plague area, attention is drawn to the following regulation, a duty which should conscientiously be carried out:—

"Every person becoming aware of any sickness or mortality in rats, mice, cats, dogs, or other animals susceptible to plague, not due to poison or other obvious cause, shall forthwith report the facts to the local authority and to the magistrate or the plague medical officer or any justice of the peace or any police officer. The carcass of any such animal shall, before being moved or touched, be saturated with paraffin, and shall thereafter be kept for examination."

A useful pamphlet entitled "Prevention and Destruction of Rats and Mice" (No. 238, Health) is obtainable on application to the Department of Public Health, Pretoria, and mention may also be made of Bulletin No. 4, 1921, "The Destruction of Rodents by Use of Poisons" (obtainable from this Office; price, 3d. prepaid). Both furnish information that will be found invaluable by the farmer in clearing his farm of a pest, the danger of which, unfortunately, is not yet sufficiently realized.

Wart Disease of Potatoes,

What is considered the most destructive pest of potatoes—wart disease—has been discovered in the Impendhle Division of Natal, and following the article on the subject that appeared in the May, 1922, issue of the *Journal*, attention is directed to Proclamation No. 90, 1922, which declares the farms "Castle Howard" and "Killaloe," in the Impendhle Division, as restricted areas from which no potato tubers or any parts of potato plants may be removed without special permission, and to the regulations published under Government Notice No. 912 of 1922, which apply to the above-restricted areas. Both are published in the *Gazette* of the 9th June, 1922.

The Great Problem of Drought in South Africa.

It was in the October, 1920, issue of the *Journal* that mention was made of the appointment of a Commission to inquire into the best means of avoiding losses by drought, and of the wide scope of inquiry embraced in its terms of reference. Since then the Commission has been steadily pursuing its investigations, and its members have travelled far and wide, visiting in the course of their journeys the remote areas as well as the nearer districts of the Union where the grip of drought has left a clearly discernible mark in the stretches of deteriorated veld that are encountered. The subject does not only concern the farmer: it is of national importance, for the continuance of present conditions which give rise to the recurring droughts that afflict this country will leave a heritage of loss to the whole community disturbing to contemplate. To the Commission the trail of consequences leading to our present unhappy position is plainly visible. The prevailing system of kraaling sheep due cheifly to the jackal danger, and also to the inadequacy of drinking water facilities, the consequent destruction of vegetation and the resulting soil erosion, leading in turn to a serious diminution in the efficiency of the country's rainfall, constitute a chain of misfortunes that in the comparatively short space of our history has brought the country to a point where it is imperative to take steps to stay the process now gradually eroding the foundation of our material existence—the soil. The causes leading to the aridity of the country that is giving rise to so much misgiving, are told in the Interim Report* of the Commission, and we would urge every farmer, particularly those engaged in sheep farming, to obtain a copy. It is a report of absorbing interest. To cope with the growing danger the Commission is of opinion that certain steps are essential. In the first place the organization of the farming community must be advanced with all possible dispatch; the abandonment of the present system of kraaling for one under which the sheep can live a natural life is an essential and it connotes the extermination of the jackal, that animal of ill-omen to whose continued presence must be attributed so much of our present trouble. Then it is recommended that cheap fencing material be provided in order to enable farmers more speedily to adopt a system of paddocking the value of which cannot be emphasized sufficiently, and which has already been advocated in the *Journal* (The Value of the Paddock System, August, 1921); with it stands the need for farmers to improve their facilities for watering stock in which the Commission recommends that the State should give every encouragement. One of the most important principles recommended is the adoption by the State of some system of controlling soil erosion. The prosecution of investigations into certain grazing and fodder problems the Commission finds a matter of necessity. And with it all the Commission advocates the inauguration of propaganda which will spread throughout the wide reaches of the country, bringing enlightenment to the farmer of the facilities already provided by the State for the purpose of assisting him in his farming pursuits, and, above all, urging the need of reformation in farming methods to combat the drought menace, and enable him to succeed where otherwise failure is certain.

* "Interim Report of the Drought Investigation Commission, April, 1922." Obtainable from the Government Printer, Pretoria. Price 2s., post free.

An Oversea Comment on South African Wool.

Through the medium of its *Journal* and its officers, the Department has constantly impressed on wool growers the need of adopting certain methods that alone can ensure success, and it is clear that the South African pastoralist is alive to the requirements of the trade, and is striving to meet them in every possible way. It is of value therefore to know the opinion of an expert oversea, who, having spent a life-time in the wool trade, has a practical knowledge of the growth of the country's wool industry, and can view impartially our present position. Writing at the end of April last, he makes the following statement:—

As one who is in a position to make impartial observations, the writer may perhaps be allowed to express his appreciation of the steps which are being taken by the sheep breeders' societies throughout the Union to further the interests of sheep breeding and wool growing in their part of the world. The Graaff-Reinet Wool Growers' Association is acting with commendable foresight in considering the most up-to-date methods of sheep breeding, and the preparation of clips for market on Australian lines. There is no doubt that the progress made in wool growing in Australia and New Zealand is largely due to the care which in a general way is exercised in preparing clips for sale, and if South African wool growers wish to take the place which is rightfully theirs in the same sphere, they will have to follow out the same principles. If possible let them try to go one better. The writer saw samples of the Graaff-Reinet wool sold at Port Elizabeth at the end of last January, and a glance at the catalogue showed that sheep farmers in that district were working on right lines. It is gratifying to know that so many are alive to the needs of spinners and manufacturers, and are endeavouring to provide what the market needs. It is disappointing that while Europe is clamouring for good long combing wool, twelve months Capes are not available. Cape farmers will not be shearing their twelve months' clip till about next September. In the meantime the market is bare of good combing wool. The writer is fully aware of the circumstances which for many years have compelled shearing sheep twice a year in South Africa, but the country is developing and progressing, and eventually even all the small farmers should be able to afford to let the fleeces remain on their sheep until they have attained a twelve-months' growth. Anyhow, the achievement of the Graaff-Reinet growers should be an inspiration to others. The clips grown in that district have been the object of widespread comment, largely because of their length of staple, which was three to four inches. The clips have also been excellently prepared for market, and there is no doubt that the wool growers' associations in the Union have an excellent educative opportunity before them. The majority of South African clips could do very well with an infusion of Australian blood to help to produce a somewhat better-grown staple. The only word of warning which needs to be uttered in this connection is about quality. This should not be sacrified entirely to length of staple. It is to be hoped that the tendency seen in Australia will not develop in South Africa. The quality of much of the wool grown in Australia is not as fine as it was twenty-five or thirty years ago. Coarse-haired rams have been used too much. Sheep men in the Graaff-Reinet District, who are using Australian

blood need to bear this in mind. Several of their clips are just on the "bare" side. In a few cases they are no more than super 60's quality. For top-making purposes these wools will serve admirably, but an increase of four to six points in fineness would make them all the better.

Skins, Raw-hide Leather and Riems: Farm Manufacture.

In our country of vast distances and remotely situated farms, the dwellers in outlying parts—usually, of course, the farmer—have often to turn their hand to many things that others in the ordinary course relegate to those whose special avocation in life it is to perform such classes of work. Nor is it only lack of opportunity that calls for the ingenuity of the farmer, but often the expediency that requires the many economies which alone will bring working expenses within the compass of his means. And in the Union, where game is still plentiful and which is devoted largely to pastoral pursuits, it is clear that there will be few farmers who at one time or another will not need to know something about the tanning and braying of skins, and the manufacture of raw-hide leather and riems. It is with a view therefore to assisting the farmer in this section of his home industry that an article has been prepared by Mr. Schlupp, the Entomologist, and Mr. Mackinnon, the Field Instructor in Practical Agriculture, at the School of Agriculture and Experiment Station, Potchefstroom, and is published, with illustrations, in this issue of the *Journal*. Many thousands of wild animals, large and small, are killed every year in South Africa, and their skins, which are used for a variety of well-known purposes, form a source of farm production of no small value. The home tanning and braying of these skins is not a very intricate business, and the advice given by the writers and directions how to proceed should enable those who undertake this work to turn out articles of a creditable nature and of good quality. The manufacture of raw-hide leather is also carried out on many South African farms, hides of various kinds being used, but particularly those from cattle and other domestic animals. The several processes in vogue are discussed by the writers, who point out the methods that will ensure the production of good leather. Riem-making, in particular, is a common practice, and there are few, if any, who have not at some time made their own riems for use on the farm. There are those who, undoubtedly, are adept in the process they have found most suitable in their own experience, but the many useful hints contained in the article referred to should contain something of service to all, and enable every one to produce a good class article. Mention is made elsewhere in this issue of the *Journal* to the loss the country sustains annually through the bad flaying of hides. Careful methods, without any appreciable expenditure of more time or labour, would soon remove the disability the country now suffers from this source. In like manner the application of the right method by the farmer in the various home uses to which he puts his skins and hides will be so much gained in the greater service and pleasure the superior article will bring him. It is a standard of work that is within the power of all to attain.

Ostrich Feathers and their Origin.

The ostrich feather industry of South Africa dates from the year 1865, and during the course of the half-century of its existence has greatly enriched our country, giving it pride of place as the world's chief producer of high-class plumes. It will be understood that an industry devoted to the production of an article of fashion is subject to fluctuations, and so with ostrich feathers there have been depressions and booms from time to time. The market boomed in the late "seventies" and early "eighties," collapsed a few years later, and revived again in the later "nineties." From 1905 the industry made great progress, which reached the zenith of its present history in 1913, when the value of ostrich feathers exported was nearly three million pounds sterling. Then came another slump and the war: the export of feathers fell off tremendously, the number of ostriches was reduced by half, and the industry generally declined until in 1918 it reached its lowest depths, the value of feathers exported that year being actually less than it was 30 years earlier. Afterwards, in 1919, there came a distinct revival in trade, but the volume of that year's business has not since been maintained, the trade having dwindled a good deal, and at present the demand is quiet. Yet while the industry is not now occupying the high position of former years in the Union's export trade, it is confidently expected by those intimately connected with ostrich feather production that the present eclipse is temporary and that the beautiful ostrich plume is destined again to figure prominently as a source of productive wealth to the Union. Farmers would, therefore, be well advised to collect what birds they have retained and to fatten them up for the breeding season.

It is not only the trade in feathers that has been a source of enrichment to the country; the story of ostrich farming in South Africa goes hand in hand with early irrigation enterprise, which owes its inception to the necessities of lucerne cultivation induced by the needs of the ostriches. Thus both directly and through its stimulation to irrigation schemes, the ostrich has brought considerable benefit to the country, and those who have shared in the prosperity of the past, as well as those who are sanguine of future development, will naturally take a great interest in the origin of the feather that is known far and wide as one of the most beautiful of nature's products. The various factors that have contributed to the growth of the industry in South Africa present a story far removed from the prosaic; and a particularly interesting aspect is discussed in this issue of the *Journal* in an article on "The Origin of Feathers from the Scales of Reptiles." It is written by Professor Duerden, well known for his valuable publications, the result of original research into matters concerning the ostrich. He has been in residence at the Grootfontein School of Agriculture, engaged upon the comparative anatomy of the ostrich, from which study results of practical value to the farmer are expected. The present work deals with the problem of the origin of ostrich feathers, their evolution from the scales of reptiles, and the relationship between scale and feather. It has long been accepted by zoologists that in the course of evolution birds have sprung from reptiles and that feathers have come from horny scales, but the manner in which the

latter process has taken place has never been understood. Professor Duerden demonstrates how certain conditions prevailing in ostrich chicks at about the time of hatching afford the true key to the problem. With the aid of diagrams he traces the process by which the feather is formed, which, as is found similarly in respect of the pigeon and the fowl, is actually an overlapping outgrowth from the scale.

"In the course of its development," concludes Professor Duerden, "the ancient ostrich presents us with evidence showing how the horny scales derived from reptiles have become transformed into the glorious plumes of birds, by a complex system of fraying-out of scale upgrowths: and another stage in the evolution of birds from reptiles is thus solved. It is manifest that ostrich plumes, of such great commercial importance to South Africa, and employed for decorative purposes the world over, are really nothing more than the highly specialized frayings of scales."

Lucrative Pig Farming.

Among the articles of South African production that bear witness to the progress of agriculture in the Union, bacon and ham must be included, for in recent years our exports of these articles have exceeded importations, a happy reversal of conditions existing not so many years ago. But pig farming for the purpose of supplying the raw material to the factory is still in its infancy, and it is only recently that this lucrative form of farming has begun to receive proper attention. The foundations of an industry have been laid in the importations of carefully selected pedigree pigs, while greater systematic breeding and feeding, and management generally are being observed than in the past, but the majority of pigs found in the Union are still of an unsatisfactory type, and there is much scope for development. The Union has many favourable conditions for the farming of proper quality pigs in its comparative freedom of disease, abundance of feed, and equable climate. These, together with the small outlay of capital required and the quick returns obtained, offer inducements that cannot be overlooked. For with the growth of population and of closer settlement pig farming will become increasingly popular, and a sign of progress already attained is seen in the organization that has now been established in the interests of pig breeders.

The matter is of importance to farmers, and will become increasingly so, and a series of articles on pig farming by Mr. Morkel, the Lecturer in Animal Husbandry at the Elsenburg School of Agriculture, has been commenced in the *Journal*, the first contribution appearing in the December, 1921, issue. Mr. Morkel has specially studied this subject, and his writings are of practical value to farmers interested. In this issue another contribution to the series is published, dealing with that well-known breed, the Large Black, its origin, breed, characteristics, etc. The many points of value of this breed, and the popularity it has attained in the Union for cross-breeding, are discussed, and the results given of experiments carried out at Elsenburg contain much that is of value to breeders.

Crop and Market Intelligence.

The Department issues monthly a crop report based on the advice received from correspondents in the various districts of the Union. Farmers are benefited by the crop report both directly and indirectly: directly by being kept informed of crop prospects outside of their own immediate districts, and indirectly because the disinterested reports of the Government tend to prevent the circulation of false or misleading reports calculated to depress prices. The importance of information of this nature is recognized in other countries where, with the co-operation of the farming community, every endeavour is made to ensure the publication of reliable forecasts. Closely allied to this information is that concerning market intelligence, for it is being increasingly borne upon farmers that in these competitive days they must be armed with the most recent advice respecting both the local and oversea market. At present, information of this nature is published in the *Journal*, but in future it is proposed to include it with the crop report, which will be known as the "Crop and Market Report," so that farmers and others interested will be provided with a booklet giving in a handy form intelligence of an essentially useful nature, such as crop prospects, live stock conditions, local and oversea market prices for a wide range of products, the position of certain world crops, Australian wheat and flour prices, export statistics, etc.

Advertising the Union's Raw Products.

Prominent among Continental fairs is the one held at Leipzig in Germany, which is recognized as an outstanding medium of advertisement by producers and merchants. There it is that manufacturers meet from all parts of Europe for the purpose of getting into direct touch with their clients, new connections are formed and increased business engendered. The great opportunity of advertising there the Union's products was fully taken advantage of this year in a very attractive exhibit that occupied a conspicuous position in the fair. It was visited by thousands and awakened considerable interest, and it is expected to have been the means of setting in motion new sources of trade in South African raw materials which, followed by the appointment of a Trade Commissioner on the Continent, should hold the germ of much future expansion. From a record kept of well over 300 inquiries made by manufacturers and merchants in regard to the Union's various products, and the opening of trade relations, it is found that they were not confined to German firms only, but that firms and persons in Austria, Hungary, Italy, Servia, Turkey, Portugal, Finland, Denmark, Bohemia, Norway, and Roumania were also interested in the matter of trade in our wool, hides, skins, maize, tobacco, cotton, mohair, ostrich feathers, wattle bark, and other raw products. Mr. Richardson, of the Trade Commissioner's office in London, was in charge of the exhibit, and sedulously fostered the interests of the Union's producers by putting many in direct touch with Continental buyers, and generally in making known through far-reaching advertising mediums the wealth of material this country can offer the oversea manufacturer.

The Export of Dried Fruit: Amended Regulations.

The attention of those engaged in the dried fruit trade is directed to the amended regulations under the Agricultural Produce Export Act, 1917, for the export of dried fruit, published under Government Notice No. 925 of the 7th June, 1922, and which cancel those previously issued. The new regulations should carefully be studied by all concerned, for they contain certain features that exporters need to be acquainted with. There is a rearrangement in the manner of packing of the various fruits; the dimensions of the boxes in respect of currants and raisins (14 lb.) have been altered; further requirements in the manner of marking boxes are set out; fruit must be delivered for inspection not less than 48 hours (not 72 as previously) prior to loading; in grading, sultanas are to have two grades each for bleached and unbleached, the difference between the two grades to be at the discretion of the inspector, while for peaches and apricots the size of the mesh is altered. There are four new clauses regarding raisins (dried grapes) which provide for the varieties of grapes to be manufactured, the grade that may be exported, the package (boxes of 25 lb.), and the maximum moisture content (15 per cent.). Further, the inspection fee is reduced to 4s. per 40 cubic feet or part thereof.

South African Wines in Competition.

To promote the production of pure wines of merit and their consequent consumption is the object of the Colonial Wine Competition held in connection with the Brewers' Exhibition which takes place annually in London. The exhibition will be held this year from the 28th October to the 3rd November, and South African growers who intend to compete should note that entries close on the 14th October next. Entry forms are to be addressed to Mr. Arthur T. Dale, 46 Cannon Street, London, who will furnish full particulars of the competition. A limited number of these forms are in the hands of the Government Viticulturist, Elsenburg School of Agriculture, Mulders Vlei, who will, on application, distribute them to intending competitors and furnish them with all necessary particulars regarding the various sections of the competition and the general conditions governing it.

South African wines have figured prominently in these competitions, and it is trusted that advantage will again be taken this year of bringing our wines to the notice of the public oversea. The 1919 competition, it will be remembered, resulted in Australia annexing all the first prizes, while South African wines secured only one second and four third prizes. The next year there was a reversal in favour of South Africa: out of the fourteen classes as many as eleven first, five second, and two third prizes being obtained, Australia winning in two classes only. Last year there was a more even distribution of prizes: Australia obtained more of the first prizes awarded than South Africa, but in the aggregate number of awards South Africa was first. The judges' reports on the exhibits are interesting and worthy of consideration. In making their awards in last year's competition they state that some of the wines should

compete favourably with Continental growths. They gave the opinion that the competition is of practical benefit to the trade, and proves that South Africa and Australia are capable of producing wines that can compare very favourably in quality and style with those of other countries. An oversea trade in our wines is a patent necessity, but it is still very much in the pioneer stage. Those engaged in the industry, therefore, should seize every opportunity of establishing a good name on the English market. A most important consideration in this connection is pointed out in the last report of the judges to be that of cost of production which must be at a price that will create a ready demand, and competitors, it is noted, are invited to state the stock they hold of each sample sent in for competition, and the price at which they are willing to sell the same. It may also be pointed out that in the report referred to above, the judges gave it as their opinion, on the wines as exhibited, that those most likely to be popular in Great Britain would be of the full Claret or Burgundy type.

The Altered Composition of Basic Slag.

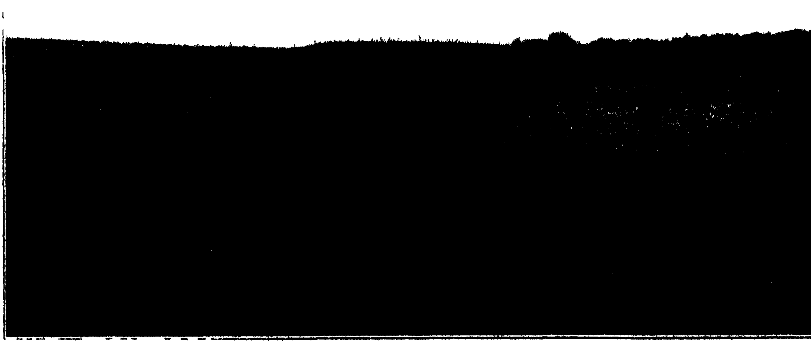
Basic slag, a by-product from the manufacture of steel, is a fertilizer rich in lime and phosphates, and large quantities are imported into the Union, as will be seen from the following table, which gives the importations in tons of 2000 lb.:—

1913	5970 tons.	1918	Nil.
1914	6832 tons.	1919	1920 tons.
1915	9027 tons.	1920	5120 tons.
1916	6231 tons.	1921	1905 tons.
1917	636 tons.		

These quantities, however, are still far below what it is estimated the Union requires annually of this fertilizer, the conditions set up by the war and the high prices which followed being the cause of the decreased importations. Basic slag is being used chiefly for grain crops in the south-west districts of the Cape Province, the chief wheat-producing area of the Union, where it is a valuable fertilizer for sour soils: it is found useful also in maize growing in certain of the soils of the Transvaal, but it is not extensively employed for this purpose at present, for economic reasons.

Anything concerning an article of such importance in South African agriculture as basic slag (known also as Thomas' phosphate or Thomas' slag), will be of interest to farmers, and an article on the subject, written by Dr. Juritz, the Chief, Division of Chemistry, is published in this issue of the *Journal*. For since the war a considerable change has come over the composition of basic slag, owing to a new process being employed in steel manufacture, with the result that the character of the by-product has been entirely altered, its phosphate content having been halved. This, of course, affects the value of basic slag, and experiments are being carried out in England with a view, among other objects, to increasing the quality and quantity of slag produced by combining with the ordinary manufacture of steel some subsidiary process. A stage of finality has not yet been arrived at in the adjustment of the matter under the

changed conditions, but the position as it appears to-day is explained by Dr. Juritz, and should be studied by farmers who are using, or who are contemplating the use of, the fertilizer. In so far as the sale of basic slag in the Union is concerned, there was a regulation to the effect that it must contain at least 12 per cent. of phosphoric oxide soluble in citric acid. Owing to war conditions this percentage was reduced, as a temporary measure, to 10 per cent., but in view of the present position, this lower percentage has now been fixed by the Government, so that in future (or until such time as it may be found advisable to make other provisions) the minimum phosphoric oxide content allowed in the sale of basic slag will be 10 per cent.



Students Ploughing, Cedara School of Agriculture.

Export of Cotton: Assistance to the Industry.

In our last issue we announced that the Union-Castle Steamship Company had reduced the freight rate for cotton to 35s. per ton of 40 cubic feet. Further assistance has since been rendered the industry by the steamship lines reducing the rate of freight on cotton seed. From Union ports and Delagoa Bay to the usual direct ports of discharge in the United Kingdom the rate is now 45s. (formerly 60s.) per ton of 2240 lb., with the usual shipping charge of 2s. 6d. per ton from Delagoa Bay in addition. At the same time the Railway Administration has agreed to convey cotton seed in 11-ton lots when consigned for export oversea at Tariff No. 8 instead of Tariff No. 7.

DEPARTMENTAL ACTIVITIES.

(NOTE.—The work of the several Divisions and Schools of Agriculture covers a wide range of agricultural industry in the Union, and we give hereunder notes and observations from certain of them treating with matters of special interest coming under their purview month by month. The object of these notes, which are not concerned with general routine work, is to inform the farmer of such matters as are calculated to be of interest and helpful to him at the present time.—EDITOR.)

THE DIVISIONS.

ENTOMOLOGY.

Gallworms and Root-knot.—The warts on potato tubers and the knots and galls upon the roots of many cultivated plants and weeds are due, in most cases, to the invasion of such underground parts by microscopic worms. These creatures are always so small that with the naked eye they cannot be seen either in the soil or when embedded in the tissues of the plants. Quite a powerful microscope is needed to inspect them. At the time of writing a considerable interest has been awakened in potato diseases throughout the Union, and quite a stream of warty potatoes flows to the Division for examination. The trouble is known to be widespread, and it is remarkable how little its true nature is recognized by the majority of our correspondents. For this reason the following brief summary of the nature and habits of the pest is submitted for the readers of these notes.

The worms in question, variously called eelworms, gallworms, and nematodes, are not insects, but belong to the same branch of the animal kingdom as do the earthworms and those intestinal parasites known as pinworms, threadworms, wireworms, and tapeworms. They are in the soil, as a rule, when the crops are laid down, and enter the surface layers of roots and tubers, and there develop. The females become swollen with young and have the appearance of minute balloons. They can be discerned as small, milk-like spots if the gall or wart is cut into particularly thin slices with the help of a razor; a penknife is seldom equal to the task of cutting a thin enough slice. The presence of the worms in the plant tissue sets up an irritation and the characteristic swellings follow. Later on the swelling breaks down to decay, and an increased brood of worms escapes into the soil. Many plants, especially tomato, pumpkin, and melon vines may die outright as the result of gallworm attack. These worms do not live deep in the ground, and it is for this reason that many trees thrive, although their surface roots are full of gallworms. Peach trees, fig trees, and grape vines are frequently infested, a fact which explains the numerous failures where it is attempted to grow vegetables near by or among permanent plants of this sort. Ordinarily, lands become infested either

through being laid down with infested seed potatoes or through the wash over them of infested soil by storm or irrigation water. Once infested, lands will remain so as long as plants or weeds favoured by the worms grow upon them. There is really no end to the list of plants in the roots or tubers of which gallworms may not flourish.

Very few plants appear to be quite immune. The following are never, or at least very seldom, attacked:—

(1) The velvet bean and several species of the genus to which it belongs.

(2) Many grasses, such as crab, red-top, and Johnson grass.

(3) The millets.

(4) Some varieties of oats and barley.

(5) Maize, wheat, kaffir corn, sorghum, rye, and timothy.

In dealing with this pest, prevention is far better than cure. It should be the practice of every farmer or small holder to keep a most searching and careful watch for any indication of this trouble. Seed potatoes especially should be carefully looked over *before* planting; and only clean, smooth seed should be sown. The field into which a crop is to be planted should be inspected to see if weeds or other plants thereon are not perchance harbouring the pest. This is a most important point, and if carefully observed may save much future trouble.

There is no entirely satisfactory treatment for lands bearing perennial crops. However, any cultural method that encourages deep rooting on the part of the attacked crop will help. For land infested with gallworms, and not bearing a perennial crop, the following methods may be recommended:—

(1) Keeping the land free from vegetation of all kinds for two years. No crop, no weeds, no plant of any description must be tolerated; in other words, absolutely bare fallow must be practised. This is a most effective method, but it is not very practicable.

(2) Planting the land to non-susceptible crops for at least two (perhaps better three) years, using in the winter small grains, such as wheat, rye, or oats, and in the summer the velvet bean, Florida beggar weed, the iron cowpea, or even peanuts (monkey-nuts), and scrupulously destroying all weeds that might harbour gallworms.

(3) Making heavy applications of fertilizers, especially those containing potash, except where the soil already contains this in abundance. This treatment often reduces gallworm injury greatly.

(4) Where possible, flooding the land for a period of some weeks.

(5) Where rain is not likely to interfere, ploughing, and allowing the soil to dry out for several months.

(6) Preventing, by the use of embankments, ditches, etc., the washing of soil from infested fields to the field which it is desired to free from the pest. The introduction of the pest by tools, wagons, farm animals, etc., should be avoided.

Where it is desired to put down seed beds for tobacco, tomato, and the like, an attempt may always be made to free the top soil of these creatures. The soil should be loosened, and then roasted by maintaining over it for some time a vigorous fire of brushwood.

Cotton Stainers and Cotton Staining.—Cotton stainers usually get the whole blame for any staining or discolouring of the cotton lint. It is undoubtedly true that stainers and other sucking bugs of a like nature do cause some staining, and this staining may be the direct result of the insects sucking the juices from the cotton seed or piercing the rind of the boll. On the other hand, the staining may be brought about indirectly by the subsequent invasion of the boll by bacteria and fungi through the bug punctures. Any extensive staining of the lint by the excrement from the stainers is largely discredited now; and staining by the crushing of the bodies of the insects is relatively infrequent, and not of much importance.

Observations made in the Rustenburg District, where the weather at picking time is usually dry and sunny, show that stainers may be present in great numbers, and the percentage of stained lint very low. Again, in the eastern Transvaal, where weather conditions may be moister at picking time, considerable staining has been observed in fields having only a moderate number of stainers.

The control of stainers by any direct method is not practicable. However, a thorough clean-up after the cotton crop is off will do much to reduce the numbers of these pests. Surroundings clean of plants related to cotton should be maintained. The stainers usually remain on their native food-plants till late in the summer, when they migrate to the cotton plants; on this nourishing supply of food they increase rapidly. But then it is too late to do much to check them. Collecting the stainers into tins, which may be easily done, as they congregate on the opening bolls, is a method employed in some countries; but it is doubtful if the method will prove practicable in this country where labour costs are higher.

Weevils and Fruit Trees.—Many reports reach the Division of injury to young orchards by small, dull-coloured weevils or snout-beetles. These are always wingless forms, whose earlier stages are passed underground, where the grubs most probably feed on roots of veld plants. The beetle stage does not last long, and for the greater part of the year the creatures live a hidden existence. Since the mischief usually happens to trees more or less recently set out in new lands which previously only carried native plants, it follows that the weevils emerging from the soil are compelled to attack the trees in the absence of their normal food supply. It would be different if they could fly, as they would then migrate in search of what is more natural to them. But, being compelled to crawl and pressed by hunger, they congregate upon the young fruit trees. This trouble is usually one of but a season in orchards that are kept clean, and is best met by hand-picking the insects until their numbers are sufficiently reduced. An application of arsenate of lead to the young trees may also give them some protection.

The Lily Borer.—The Natal Entomologist has found that the mischief of the *crinum* borer, *Brithys pancratii*, Cyr., can often successfully be checked by spraying the infested plants with arsenate of lead. This pest feeds in the interior of the leaves and stalks; but, when the food supply in one part gives out, the caterpillar migrates to fresh leaves or stalks and again eats its way in. It is due to these compulsory migrations that the poison acts as an effective control measure.

Wattle Bagworm.—Many Natal wattle plantations have suffered severly with bagworm this season. Mr. J. H. Holley, of Sandymount, in a letter to the Division, states that in his locality the insect is practically confined to the trees along the outside of the plantations, and in prominent places, facing New Hanover, where the insect has been far more abundant. He recognizes this peculiar distribution as evidence of the spread of the insect by the wind, and revives the suggestion that screens of eucalyptus or other immune trees might be used for the protection of wattle plantations. It seems quite probable that in some, if not all, seasons such screens would catch no small proportion of the wind-borne worms under the topographical conditions of some localities, but it is doubtful if they would be efficient in the generality of cases. From his observation when long resident at Maritzburg, Mr. C. Fuller came to the opinion that the young insects were borne largely by the warm berg winds, and commonly carried rather high in the air. These winds blow strongly for some hours and cease suddenly, and it was his idea that perhaps after having been carried many miles the insects fall somewhat abruptly when the wind drops. Where the land rises considerably from a valley in which the pest is bad, it would seem that screens of immune trees on the heights might catch many of the insects being borne by the wind, but in most places the insects probably reach vegetation much more from above than from the side.

The Cycad Looper.—*Encephalartos* and other *Cycads* are subject to the attack of a looper caterpillar, *Zerenopsis leopardina*, Feld. The Natal Entomologist states that these loopers have been very prevalent lately along the Natal coast. The adult moth lays her eggs in clusters of 50 to 185 on the plant, and the caterpillars confine their attention to the young tender leaves. These attacks disfigure and stunt the plant, a serious matter with the slow-growing Cycads. Arsenate of lead powder, 2 ounces in 4 gallon of water, has proved a successful control measure.

Thrips Defoliating Avocados.—During May, 1922, an outbreak of thrips (sp. undet.) came under notice on some avocados growing near Nelspruit, in the eastern Transvaal. All stages were present in great numbers, and on some trees the attack had been so severe that whole branches were leafless. The trouble is characterized by patches of yellow leaves, which show up contrastingly against the bright green of the normal foliage.

AGRONOMY.

"Sahara" Yellow Dent Maize.—A farmer in the Lichtenburg District obtained some time ago from this Division about 100 lb. of "Sahara" yellow maize for experimental purposes. In reporting he states that the mealie in his experience is the only drought-resister in his district. "I planted," he writes, "the 100 lb. in black turf soil, where no mealie will thrive during periods of drought. The 100 lb. gave me a yield of one hundred bags of 206 lb. each. We had good rains up to the end of December last, but since then we had no rain, and towards the end of February the cracks in tne land were from 12 to 18 inches deep, and not a particle of moisture is visible. Everybody was surprised at this. This is quite a true statement, which I can prove."

The Inspector of Grain of this Department recently visited a farm about 10 miles outside of Pretoria to inspect this same variety, and he reports that only 25 lb. were sown, and that the yield was 20 bags, each 203 lb., true-to-type "Sahara." It was sown under dry-land farming conditions, depending entirely on the usual rainfall. This variety was also introduced in the high veld (Standerton and Heidelberg Districts) by the Division, and from all reports received proved to resist drought very well, and is also a good yielder. Seed can now be had (25 lb.) on application to the Government Agronomist, Department of Agriculture, Pretoria, under the usual co-operative experiment system, the conditions of which are that the farmer must return to this Department double the quantity of seed after harvesting season. This variety should be sown 16 to 20 lb. per morgen. Farmers growing this variety can be assured that their maize, if properly cleaned, will pass for export under Grade No. 4, "Flat Yellow." It may be mentioned that 10 lb. seed of this variety were imported by the Government Agronomist some years ago from the Argentine. Small samples of seed were distributed to many farmers, and the "Sahara" is claimed to resist drought on much poorer soils than most other varieties. The conference of crop investigators decided that there are two similar strains to "Sahara" Yellow in this country.

BOTANY.

"Bothalia."—During May there was published the second part of *Bothalia* which is the official record of original research carried out in the National Herbarium. Part II contains the following papers:—

1. "South African Ascomycetes in the National Herbarium," Part II. This consists of descriptions of 35 microscopic leaf fungi, of which 21 are new species.
2. "The Thorn Pears" (*Scolopia* spp.), giving the most recent information we have on the distribution of these forest trees and shrubs. A new species, *S. Thorncroftii*, is described.
3. "The Genus Ochna," to which belongs the well-known "Rooihout." The number of species now recorded for South Africa is nine. Two new species, one from the Transkei and one from the Woodbush Forest, Transvaal, were brought to light.
4. "The Genus Olinia" to which the well-known Knysna tree "the Hard Pear" belongs. Prior to working this genus it was thought that only two species were found in South Africa, but a third very distinct species has been separated.
5. "The Genus Cyclopia, Vent." Several species of this genus provide local bush teas, and the genus was revised as a basis for any future cultural work which may be undertaken with these plants. Several species hitherto unrecorded have been described.

Combretum Gum.—As a result of the article on Combretum gum which appeared in the *Journal* (December, 1920, p. 834) a number of inquiries have been made as to the possibility of collecting the gum in quantity. The collection of the gum from trees in their natural habitat cannot be expected to yield sufficient quantity for its exploitation on a commercial scale, and more satisfactory results will be obtained when trees can be planted in large numbers in suitable localities. Seeds of *Combretum erythrophyllum* have been planted experimentally near Pretoria, and the seedlings are doing very well. The young trees are about 3 feet high although they are only twelve months old. It will be a matter for experiment to determine at what age the trees will yield the maximum of gum.

Cassava is a crop which should do well in the sub-tropical parts of the Union, and the powdered starch extracted from its large tubers commands a ready market in Europe, and would probably find a market in South Africa. Not only are meal, flour, tapioca, and other starchy foods prepared from Cassava roots, but they are also a valuable source of alcohol, glucose, and dextrins, and the residues are largely used as feeding stuff for live stock.

The Prisons Department has been interested in the cultivation of this crop, and an experiment recently carried out on a small scale at the Reformatory at Eshowe, in Zululand, proved that the plants could be successfully reared in that district. They have also been grown successfully in Swaziland and in the Northern Transvaal.

Cassava belongs to the natural order *Euphorbiaceae* and the genus *Manihot*, and is related to the Ceara rubber tree. It is a much branched shrub that, under cultivation, reaches a height of 6-10 feet. The leaves are large, roundish, and deeply lobed; the flowers are borne in spreading clusters at the ends of the branches. The fruits contain the seeds about the size and shape of castor oil seed, to which it is related. The root tubers are large, and vary in size according to the age of the plant, but usually when ready for harvesting they are from 1½-4 feet long, and are borne in clusters at the base of the stem.

There are two kinds of Cassava grown, the sweet and the bitter. Authorities differ as to the exact relationship of one with the other; by some they are considered distinct species, the bitter being known as *Manihot utilissima* and the sweet as *Manihot palmata*, while other botanists consider the latter but a cultural variety of the former. The sweet Cassava is on the whole the better variety to cultivate. The tubers yield a greater amount of starch, and contain less of the poisonous hydrocyanic acid than the latter variety. The poisonous acid commonly known as prussic acid is present only in the outer layers of the sweet Cassava, and is removed by peeling the roots, while in the bitter variety it is more evenly distributed through the roots, and can only be neutralized by heating.

As Cassava roots decay very quickly after removal from the ground they must, therefore, be dried at once, either in the sun or with artificial heat. The usual process is to wash and peel the roots, and halve them longitudinally, and cut out the more fibrous central portions; the remainder is cut into strips, and laid in the sun till thoroughly dried, when they will keep for months. The drying must be rapid in order to preserve the colour of the material.

Wart Disease in Potatoes.—Attention is called to the proclamation published in the *Government Gazette* of 9th June, containing quarantine regulations for areas infected with wart disease of potatoes. A descriptive article appeared in the May, 1922, number of the *Journal.*

The first specimens of wart disease in South Africa were found on the farm Castle Howard, in the Impendhle Division, by Mr. S. Woodrow, who had recently attended a short course at Potchefstroom, which included a study of potato diseases. He suspected that the trouble might be wart disease, and forwarded specimens for determination to Mr. Puttick, the Botanist at Potchefstroom. Mr. Puttick identified the organism in these specimens as *Synchitrium endobioticum*, Perc., the cause of wart disease, and immediately called the attention of the Department to the fact that this was the first record of its occurrence in South Africa. Steps were immediately taken to trace the disease to its origin, and a thorough inspection is being carried out. Up to the present only two farms, Castle Howard and Killaloe, in the Impendhle Division, are known to be infected, but although all seed planted on these farms since 1919 has been traced to its source the origin of the disease has not yet been discovered.

Diseases in Vegetable and Fodder Crops.—As is often the case in late summer crops, diseases in vegetable gardens have been fairly prevalent this season, the following crops being noticeably affected.

Artichokes.—A rot in this crop caused by a fungus organism, at present unknown, has recently been brought to the notice of the Division. We have no previous record of any such trouble, and from the lack of any reference to it in literature at our disposal, it would appear to be an unrecorded disease of artichokes. The rot starts at the stem of the tuber, and works its way downwards in a regular manner, producing first a dry rot internally, later a soft black rot. It is thought that the organism originates in the leafy shoots, and thence travels into the tubers, but owing to the lack of material, this point is uncertain. Diseased tubers should not be stored, nor should they be used for seed purposes, and the soil from which they are taken should be planted with some other crop next season.

Cowpeas.—This crop has apparently suffered even more than other crops. At least four diseases have been recorded on it, viz., rust (*Uromyces appendiculatus*), mildew (*?Erysiphe polygoni*), anthracnose (*?Glomerella lindemuthianum*), and leaf spot (*Ascochyta pisi*). Of these mildew, anthracnose, and leaf spot are new to us on this host.

Beans—leaf spot (*Cercospora cruenta*).

Carrot—leaf spot (*Alternaria brassicae?*). We have had no previous record of this fungus on carrot, and it appears to be of rare occurrence.

Beet—leaf spot (*Cercospora beticola*).

Tomatoes.—Canker (*Bact. vesicatorium*) still continues to be prevalent. At this time of the year tomatoes thus affected present an unsightly appearance, and rot very quickly. Greengrocers are finding that they are unable to keep such tomatoes for any length of time, and are compelled to discard large quantities of them.

Molasses Grass.—The repeated and unqualified praise of Molasses grass (*Melinis minutiflora*) by a Rhodesian, which has appeared in the Press, has resulted in this Division receiving numerous inquiries for seed and for information as to the suitability of this grass for various localities in the Union. *Melinis minutiflora* is a much branched perennial with ascending culms; the very green leaves are from ½ to ¾, or sometimes even 1 inch broad, taper to a fine point, and together with the sheath are covered with sticky tubercle based hairs, which stickiness taken in conjunction with the strong fragrant Molasses-like odour, has given the plant its popular name. The flowering head is rather long and narrow, and consists of numerous very small purplish florets each terminated by a long bristle, giving the head a feathery appearance.

We have very little first hand information about the behaviour of this grass in the Union as our experiments with it at Groenkloof were not at first successful. Seed sown in October, November, and December of last year all failed to germinate, but a further lot sown in January germinated well, and good rain falling soon after sowing, a satisfactory plot of the grass was obtained, which by the 7th April had reached the height of 3 feet, but showed no signs of flowering. It was frequently irrigated and looked well till the first frosts which scorched the upper leaves; the rather heavy frost which followed soon after turned the whole plot brown to the roots.

At the Botanical Laboratories two small plots of the grass were sown in November, 1920, and November, 1921; in both the grass is at the time of writing (7th June) about 2½ feet high, and has just started to flower for the first time. Neither of the plots has been irrigated, and so far has been but little affected by the drought or frost.

Molasses grass occurs naturally at Barberton, Lydenburg, and the Northern Transvaal, and would appear to be a very promising grass. It forms a mass of succulent, soft, green foliage, which, if reports speak truly, is very palatable to stock; but until we have tested it thoroughly we cannot recommend it for the Union with any degree of assurance.

HORTICULTURE.

Citrus Growing—Lessons from California.—The Chief of the Division recently requested Mr. R. J. Blatt, scholarship student in horticulture at Berkeley, California, to make certain inquiries concerning the citrus industry in that State. The following questions were included:—

1. What is the average age of worked Washington navels when trees cease to bear a profitable crop, and what are the main causes of early decadence?
2. What can be done to control Psylla which has been known to cause heavy falling of fruit?
3. Do sudden cold spells, say a drop of 40° F. within 24 hours, cause fruit to fall from the trees?
4. What are the main reasons of external disfigurement of fruit causing an orange to be placed in a lower grade?

Mr. Blatt, after an extensive inquiry, has furnished the following interesting report:—

Bearing Life of Citrus Trees.—The profitable bearing life of citrus in California is limited to 30 or 35 years—this is the common statement—whereas many trees have been known to reach 100 years. Decline of orchards are due to a combination of causes. Failure to care for trees properly; lack of attention to irrigation, fertilization, pruning, pest, and disease control, particularly tree butchery instead of pruning, and excessive irrigation have been responsible for the decline and loss of large acreage of orchards. On the other hand, there are orchards which have received the best care, and their decline cannot be attributed to any of the above causes, but is due to some specific cause or causes.

Professor Hodgson, Farm Advisor of Los Angeles County, has studied this problem particularly, hence he is considered an authority on the subject. He is convinced that the two principal factors contributing to the early decline of citrus orchards are:—

1. Inability to feed the soil normally, occasioned through improper methods of applying fertilizers.
2. Slow but certain poisoning of the trees through absorption of toxic compounds given off by a variety of trunk and root disease producing fungi.

The citrus tree is essentially a mat-rooted tree; the feeder roots are in the main produced from long laterals, which parallel the ground surface at depths ranging from 4 to 24 inches.

In its native habitat the citrus tree is a surface-feeding plant, the fibrous feeder roots coming very close to the surface, forming rather extensive mats and feeding uninterrupted and undisturbed just underneath the damp mulch of leaf mold. The citrus tree naturally attempts the same thing all over, but in semi-arid climates the surface foot of soil becomes too hot, hard, and dry for the health of the feeder roots. Fertilizers are applied on the surface as a rule, and are ploughed in or cultivated in little deeper than the soil mulch. The feeder roots are also constantly receiving rebuffs, such as shearing off by ploughing and cultivating, and periodic baking and cooling; the result is starvation in plenty, the needs of the tree during the early years being met from the deeper soil stretches, and when these become depleted, which is the case soon after, since fertilizers are not applied deep enough, the tree begins to go back and weaker feeder roots are developed. Surface mulching with organic matter, therefore, has given surprising results in bringing back deteriorating trees: unfortunately the recovery is only temporary—three years at the most—when signs of decline are again noticed, hence surface mulching does not constitute a cure for orchard decline. It does, however, furnish a valuable means of quick recovery for ailing trees.

The furrow-manuring method of applying not only manures, but other organic fertilizers and all other save the most soluble forms of fertilizers, will do more to prevent the decline of citrus orchards than anything that might be done. One large furrow, 12 to 15 inches in depth, located between rows, is all that is necessary: the manure or fertilizer is placed in the furrow and covered up. A

healthy feeder root system will be developed, leading to the recovery of weakened trees.

Early and deep fall ploughing shears off the greater part of the older feeder roots, and encourages the growth of a new set which will greatly benefit the tree.

Referring to the last cause of citrus-tree decline noted, namely, absorption of poisons freed by trunk and root diseases, it is apparent that citrus will not stand the attack of decay-producing organisms without suffering characteristic symptoms of poisoning as evidenced by exudation of gum and yellowing and dying of the foliage.

All wounds caused either by pruning, ploughing, or insect attack should be covered with asphaltum, wax, or bordeaux paste as soon as possible to prevent entry of wood-decay organisms. Scaly bark, foot-rot, brown rot gum disease, gray mould gum disease, and shell bark are all apt to follow if wounds are not treated. To keep the tree free from disease-causing fungi have the bud union well above the ground; do not allow the soil to accumulate about the bud union; irrigation water should be prevented from standing about the trunks of the trees.

The two main factors, therefore, in the cure of deteriorated trees are: (1) Furrow manuring; (2) guarding against disease-causing fungi. Throughout this State it has been found that citrus trees on heavy and shallow soils with poor drainage are the first to show decadence, while severe infestations of scale attack and overbearing will bring about the decline sooner. These, however, as has been mentioned, are only minor factors in orchard decline.

The Psylla Pest.—With regard to severe infestations of Psylla very little is known, mainly because it is not important in California, where Psyllids do not attack citrus fruits; in fact, there is no injurious species attacking orchards in California. Mr. Essig, one of the greatest entomologists in California, recommends for their control a miscible oil, or a light distillate emulsion or a crude carbolic acid emulsion.

Devastating Frosts.—California has just experienced one of the worst frosts since the beginning of the citrus industry; in fact it was almost as bad as the 1913 freeze, when more than 60 per cent. of the crop was lost, when there was a heavy frost for five days, and the farmers were not so well equipped with frost-fighting equipment, consequently the crop was almost lost. This year, notwithstanding the advancement made in orchard heating equipment, about 50 per cent. of the crop was lost, the temperature dropped to 20° F. in many places, while the average temperature was around 24° F. Usually a farmer will apply artificial heat to an orchard if the temperature drops below 28° F. It is evident that 28° F. is dangerous for citrus. Oranges, if fairly dormant, will stand a temperature of 25° or 26° F. for an hour or so without injury. Below 25° F. the fruit begins to freeze; first that on the outside near the ground, and later the inside fruit. At 20° to 22° F. the twigs begin to die back, and the leaves fall, while 17 or 18 degrees for four or five hours, unless the tree is quite dormant, will kill them back to branches two or three inches in diameter. Lemons are more tender, and the fruit will be injured at 26° or 28° F. Limes are killed back considerably at 28° or 30° F.

Blemishes of Citrus Fruits.—These may be classified under four heads: Insects, fungus, mechanical, and physiological blemishes.

(1) The blemishes due to insects are: Thrips scars, tortrix worm holes, scale insects such as red, yellow, purple, and the sooty mould which follows and grows upon the excretion of the black, gray, and brown scales, mealy bugs, red spiders, silver mites, grasshoppers, and katydids.

(2) Fungus blemishes.—The fungi which produce injury to the fruit are brown rot (*Phythiacystis citrophthora*), blue mould (*Penicillium italicum*), green mould (*Penicillium digitatum*), grey mould (*Botrytis cinerea*), sooty mould (*Miliola camellia*), cottony mould (*Sclerotinia libertiana*), wither tip (*Colletotrichum gloeosporioides*), and black rot of the navel (*Alternaria citri*).

(3) Mechanical blemishes.—Serious losses are due to the following: Bruises, thorn stabs, cultivator scars, clipper cuts, stem punctures, machine injuries, and fumigation scars. These can to a large extent be prevented by carefully handling fruit and using correct equipment. The following are also responsible for bruises or blemishes, but to a much lesser degree: Hail scars, soil scars, and wind falls.

(4) Physiological blemishes are due to sunburn, frost, off-bloom, mottled leaf, brown spot, and cracks and splits. Seventy-five per cent. of the culls in the citrus industry are due to six causes, which follow in order of their importance: Splits, bruises, thorn stabs, thrips scars, sunburns, and worm holes. Brown rot has not been taken into consideration, since it does not develop until the fruit leaves the packing house.

There is no effective control for splits or worm holes, but the other four main causes of blemishes may be overcome to a large extent; bruises may be controlled by careful handling of fruit, while thorn stabs are being controlled by thornless varieties, careful pruning, and windbreaks; pruning will also control sunburn to a large extent; a spray of lime sulphur water and black leaf extract is used against thrips.

Frosted Citrus Fruit.—In sorting of frosted from unfrosted citrus fruit, the successful segregation is impracticable from the external appearance of the fruit. The principles of the method now successfully adopted depends on the difference of the specific gravity of frosted and unfrosted fruit, the former being considerably lighter. The specific gravity of a well-grown unfrosted orange is approximately .82, whilst that of one frosted is considerably less. Before this difference in specific gravity is at its maximum the fruits should remain on the trees for from 6 to 8 weeks—after the occurrence of the frosting—which means that for export purposes segregation should not take place for at least two months after the injury if the frosted fruits are to be separated with any degree of certainty. This time must be allowed for the changes in the fruit to take place.

Various methods and devices to effect this separation have been tried, but the "Frank Chase Water Separator" is the only one retained as being efficient and not expensive. The machine is thus

described by Coit in his "Citrus Fruits":—"This machine consists of an oblong tank through which water may be made to circulate at definite speeds by a small propeller. The oranges roll down an incline, and drop into the moving water from the height of a foot or more. The light, frosted oranges bob up to the surface quickly, whilst the sound heavy fruit is slower to rise. Meanwhile the oranges have been carried along by the current, the sound fruit passing under and being caught by a horizontal wire screen, while the light fruit is carried above it. At the farther end of the tank the two grades are lifted by conveyors and delivered to separate bins. By adjusting the position of the screen and the rate of flow of the water any degree of separation desired may be secured. The device enables the grower to save whatever sound fruit he may have left. The frosted fruit, if not seriously injured, may be shipped under a special frost brand or it may be used as a fertilizer or made into various by-products."

It may be said that the water separator does not work satisfactorily with lemons for the reason that they are not round and the depth to which they sink in the water will depend to an extent on the position in which they happen to strike the water surface. For the separation of lemons the denatured alcohol bath (one of the devices first tried in the separation of oranges and discontinued on the invention of the "Chase Water Separator") is still used. A layer of lemons is placed in a large wire tray, and submerged in the alcohol, which has a specific gravity of .82. The frosted lemons float and are removed by hand. Frequent tests with the hydrometer are necessary in order to keep the liquid at the proper density.

TOBACCO AND COTTON.

Advice for Prospective Cotton Planters.—Begin now to prepare your land for next season. Fall and winter fallow land is always better than spring ploughing.

Sow the seed immediately after the first good spring rain; between 15th October and 15th November is the best time. Use a double-row cotton planter preferably. Sow about 25 lb. of seed to the acre in rows 3 feet 6 inches to 4 feet 6 inches apart, depending on fertility: the more fertile the land, the greater the distance required. Cover the seed from 1 inch to 2 inches.

Use seed of one of the long staple varieties, such as Watt's Long Staple, Zululand Hybrid, Griffin, Improved Bancroft, and Uganda. Seed should be bought at 3d. to 6d. per lb.

Begin cutlivation as soon as the rows can be followed, and continue as long as the cultivator can pass between the rows, without doing too much damage to the bushes. The crop should be cultivated about every ten days; the early cultivations may be fairly deep, say 4 inches or 5 inches, the latter ones shallow. Hand hoe in the drill between the plants when necessary.

When the plants are about 8 inches to 10 inches high, thin them (pull out), leaving one every 12 inches to 18 inches.

Harvesting Cotton.—Begin picking when the field is fairly white, when one-third to one-fourth of the bolls are open, about three weeks after the first bolls burst. Three to four pickings are necessary to clean the field, and these pickings come about ten to twenty days apart, depending on the heat. Any dirty or stained cotton should be kept separate. Do not harvest immediately after a rain or while the dew is still on. The cotton should be dry when picked; if not, spread it out on a bucksail for a few hours, till it is dry. Tramp the seed cotton into a wool pack, 400 to 450 lb. in each pack, sew up the end of the pack, and write your name on it before sending it to the gin. This machine separates the seed and lint.

One native should harvest about one muid bag well filled (50 lb.) in a day, at a cost of 1s. to 2s. per bag. Hiring labour by piece work for the harvest is the best method.

Approximately one-third of the weight is lint and two-thirds seed. The present price of lint in England of American middling quality is about 11.5d. per lb.; our lint usually runs 50 to 150 points *on* American middlings (i.e. ½d. to 1½d. per lb. above middling prices).

After the cotton is ginned the lint is put into compressed bales, then it is ready to be shipped to the oversea market. The seed may be used for reseeding purposes, sold to an oil mill, or ground and fed to cattle.

THE SCHOOLS OF AGRICULTURE AND EXPERIMENT STATIONS.

GROOTFONTEIN, MIDDELBURG (CAPE).

Sheep-feeding Experiments.—The experiments with prickly pear are being continued and extended to include the feeding of prickly pear to small stock running on poor dry veld. A summarized account of the experiments to date was sent during the month to those daily papers which circulate in the present drought-stricken areas, with a view to advising farmers how to make the best of whatever prickly pear they may have on their farms. Hamels were kept alive for about 250 days on nothing but prickly pear; but during that period they lost much weight. Another outstanding feature of the trials was found in the wonderful way in which a small dai ration of lucerne improved the availability of the nutritive constituents of prickly-pear; another feature was the rapid recovery to prime condition of prickly-pear-fed sheep when turned on to the veld after the early summer rains. Perhaps still more interesting is the fact that for over 400 days certain of the animals had no other source of water than prickly pear " leaves."

Cattle and ostriches are also being fed on rations in which prickly pear is a very important item—the sole one in some cases—but it is yet too early to report progress.

Chinese Lucerne.—The last cutting was made on the 17th May, certain outstanding plants excepted, which were not cut because it was desired to see how they would stand frost. Several of them were still unharmed on the 24th May.

Potatoes.—The yields of the varieties Early Nugget and Epicure this season were 3040 lb. and 11,600 lb. per acre respectively. The seed was obtained from Scotland.

Potatoes and Tuber Moth.—It was observed in digging potatoes this month that they were badly attacked by the "tuber moth." Potatoes from the same land, lifted in February, were practically free from this pest: this would seem to point to the necessity of very thoroughly earthing up potatoes that are to be left in the ground for some time after reaching maturity.

Irrigation Plot Experiments.—The Assistant Director of Irrigation (Mr. Herdman) inspected the plots on the first of the month. Such good progress has been made with the work that it has been possible to give 260 of the plots their first irrigation, preparatory to seeding them with the "uniformity" test crop. A great feature in this experimental work will be the measurement of the water applied in irrigation.

Water Pipes.—Wherever frost is severe, as in the Karroo, it is now desirable to protect water pipes to prevent bursts. This is very effectively done by wrapping round the pipe a 4-inch wide strip of sacking or hessian wherever it is exposed above ground. Burst pipes may temporarily be repaired by wrapping several layers of 1-inch linen tape, previously painted with white lead, red lead, or ordinary paint. It is also helpful to put a layer of paint on the crack—which is usually possible if the water pressure is not too great—and more paint on the tape as it is wrapped round. A narrow strip of linen is a good substitute for linen tape in the above-described operation.

Agricultural Implements.—Mowers, reapers, and binders, and other implements which are not used during the winter months are now profitably overhauled, cleaned, and repainted, so as to be ready for next season. All bearings and moving parts should be thoroughly oiled so as to prevent rusting during the period of non-use. When the weather is hot, iron can often be bent without artificial heating. It is not advisable thus to try to bend iron in the winter time, for breakages are very likely to occur.

Bathurst Experiment Station.—Favourable rains fell between 7th and 13th—in all, 3 inches. Rows of not less than 1250 varieties, selections, and cross-bred wheats have been sown, and more than half of them are already up. Superphosphate at the rate of 300 lb. per acre was applied with the seed. Old mealie lands were fallow-ploughed for summer crops.

POTCHEFSTROOM, TRANSVAAL.

Mr. G. J. Bosman, Technical Assistant, who recently visited the Transkeian Territories for the purpose of furnishing advice in regard to the cultural methods employed by natives in those parts, especially in respect of maize, has furnished the following note for publication:—

Farming in the Transkeian Territories.—A person visiting the Transkeian Territories cannot help being struck with the enormous agricultural potentialities of the country. In topography it is undulating, and in some parts quite mountainous. Besides being fairly watered, it has a good rainfall compared with other parts of the Union. The average annual rainfall for Umtata was 23.5 inches for the period 1900-1921. The soil is quite productive, especially in the valleys. In some parts the country is thickly populated, e.g. Tembuland, while in other parts again it is sparsely settled, e.g. Pondoland.

Live Stock.—The total number of cattle in the Territories is given as 733,367 head. This figure would have run into millions if it had not been for the ravages of the East Coast fever which has been prevalent there for the last decade. By systematic compulsory dipping it is now well under control, and the number of cattle is sure to increase very fast from now on.

Some areas, especially East Griqualand, Tembuland, and Fingoland, appear to be excellent cattle countries, and contrary to what one would expect, the quality of the native cattle is quite fair. The class kept is not any different from those bred by most Europeans in South Africa to-day. In no single instance did the writer see any real Kaffir cattle of the type one comes across in Zululand and Damaraland. The Shorthorn breed does very well, and would probably be one of the best beef breeds for those parts.

Some districts, e.g. Butterworth and Idutywa, seem to be admirably suited for the raising of Merino sheep, and numerous small flocks are seen everywhere. Goats are also fairly plentiful, and seem to thrive best in the mountainous country along the Kei River and along the coast. While pigs remain the scavengers of the native kraals, it is not likely that this industry (on account of measles) will make much progress.

Crops.—Maize is the main crop. The variety mostly grown is a little yellow flint, which is preferred by the native to any other variety on account of its good keeping qualities when stored in pits. The total production for the Territories is not known, and it would be a most difficult undertaking to compute same, as there are hundreds of thousands of little fields of all sizes and shapes dotted all over the country. Just as impossible as it would be to survey all these little fields, likewise would it be to try and ascertain the yield each native secures, as the grain is carried unbagged straight to the pits after shelling. When the population of nearly one million is taken into consideration, it is roughly estimated that the country must produce at least a million bags of grain to keep the population alive; but it is likely that in a good season this yield is considerably higher.

It is surprising to see how little kaffir corn is grown. The reasons for this appear to be the bird menace and the lateness of the arrival of the spring rains during the last couple of years. A small white trailing bean, as well as pumpkins, are sown on the same land as the maize. Hardly any kaffir beans—the staple crop of the natives in other parts—are sown.

The coastal area is very well suited for the production of tobacco and cotton, and while a fair amount of the former is grown, the growing of the latter has not yet been taken up by the natives. Peanuts appear to thrive well along the coast, where the growing season is longer, the temperature higher, and the rainfall greater than in the more inland districts; but very little is grown at present.

At Port St. Johns and along the banks of the Umzimvubu River, tropical fruits such as citrus, bananas, papaws, pineapples, etc., are grown very successfully by some white settlers. Maize does also exceptionally well here, and yields of 20 bags per acre are nothing uncommon. To solve the maize transport difficulties, the nearest railway station being 63 miles distant, a number of farmers have started pig-raising on a large scale. These animals, after being fattened on maize, are shipped by boat to Durban or East London.

While the agricultural practices in vogue by the natives are still crude and primitive, signs of improvement are in evidence everywhere, and the time is perhaps not very distant when the native territories will prove to be of great economic importance to the Union.

Sterility in farm animals is widespread and of much more frequent occurrence than is commonly supposed. It occurs in both sexes, and its causes are manifold. It seems to be most common in those animals which are closely confined, and hence is more often observed in dairy and stud cattle. Failure to breed on the part of valuable animals, of course, leads to heavy financial loss. It is not intended to examine all the causes of sterility, but now that the show season is over and matters concerned therewith are fresh in breeders' and exhibitors' minds, certain observations on stock exhibited at the various shows relative to the subject of sterility will not be out of place.

The outstanding feature of the cattle exhibited at the leading shows this year, was the splendid condition of almost all animals exhibited, males and females alike. One is often tempted to inquire what the breeding capacity of these magnificent animals is, because such high condition is not conducive to the normal functioning of the reproductive organs; in fact, it is one of the causes of sterility.

Overfeeding and Idleness.—In order to prepare animals for show purposes, they are generally very comfortably stabled, fed heavily, and denied proper exercise. Some animals so treated take on fat readily, and often fail to show any signs of sexual desire. This tendency to loss of sexual vigour on account of overfeeding and idleness increases with age. Show bulls, cows, and heifers, continuously kept in a presentable show condition, invariably become sterile with a continuance of this high show condition. It is true that the tendency to loss of sexual vigour is of a purely functional nature, and can be rectified by proper management, provided that such management is applied sufficiently early.

The sexual vitality of many of our most richly bred animals is often temporarily impaired, and sometimes permanently destroyed in the process of fitting them for the show ring, and keeping them presentable for the next show. It is a great pity that some of our leading judges of both dairy and beef breeding classes are too prone to allot premiums to the fattest animals, and fail to see the merits of outstanding animals, simply because in the case of a cow the animal has suckled a calf or had a long lactation period, and is not in high condition—show condition—or in the case of a bull that had been used very profitably in the herd and is naturally not fat.

Show Dangers.—The dates on which the leading shows are held also militate against the fullest use of sires and dams, because the show animals must be fattened and fitted for the show at a time when mating is to be done. Cases of sterility which have resulted from the fact that stud stock were kept in too high a condition can, unfortunately, be instanced from the Schools of Agriculture. During the early years when several more breeds were maintained than to-day, it was neither convenient nor possible to give the proper care and exercise to the several bulls, with the result that several became sterile at an early age, when they should have been useful for several more years. Often a bull is neglected owing to his vicious nature; but this can be overcome in the case of a valuable animal by exercising him in a paddock leading from his box and surrounded by a good rail fence or wall. Much difficulty has also been experienced in breeding show heifers after a show career. One or two such heifers only bred when five years old, and others remained queens (barren) all their lives. Show cows invariably give birth to very diminutive and often weak calves.

Pig-breeding Losses.—The losses incurred in pig breeding on this account are also very severe. Pigs are, as a rule, very badly neglected as regards exercise; they are penned up too much, and very often no adequate facilities for outdoor exercise exist, viz., suitable runs, with or without grazing, to which breeding animals could have access for the greater part of each day. Such provision will minimize the losses from sterility to a great extent. Sows and boars excessively confined invariably lose fecundity at an early age. The sow begins by not showing any sex desire after the litter is weaned. She puts on fat rapidly, and the greatest difficulty is experienced to get her in heat. A continuance of this state leads to total sterility. The overfat boar that seldom enjoys a daily outing in a suitable run, may lose all sexual inclination, and becomes impotent and rheumatic at an early age.

The Remedy.—Since show animals are generally the richest bred of the respective herds, it certainly is a very important consideration that such animals are regular breeders.

Although there is no effective method of overcoming sterility from the above causes, when once an animal has become a persistent non-breeder, much could be done to relieve the situation.

In fitting breeding animals for the show it is absolutely essential that abundant exercise should go hand in hand with liberal, yet judicious, feeding. More use must be made of sunshine and fresh

air, and animals should be kept in condition on pastures, supplemented with just that amount of additional feed which will maintain good breeding condition.

The great aim of stud breeders should be to secure continued growth rather than high condition, and this applies more to young stock that fatten more rapidly and readily, because they have only their own bodies to provide for, whereas the cow may be feeding a foetus, while she yields much milk or suckles another calf, and the bull is used in breeding; however, even these older breeding animals should always be in fit breeding condition.

The judges at live stock shows can also do much to point the way to greater vitality and fitness in breeding animals exhibited by paying less attention to the amount of fat and more to the general form and natural vigour of the animal when making awards.

Calving and Calf Diseases.—Where winter calving is proceeding during July precautions should be taken against outbreaks of white scour, joint ill, and contagious calf pneumonia. As far as calves of dairy cows go, this is applicable to calving all the year round. Allow the calving to take place in the open and for some time previous to the act allow the dam access to soft green stuff. If a calf is seen to be presented normally, do not interfere, as the straining will assist in getting rid of the calf's membranes (afterbirth). The best means of prevention of the three forementioned diseases is good hygienic conditions, a clean pen, and clean bedding. If the floor of the calf pen is ground, rather allow the young animal to remain out. A pen, of which the ground is the floor, that is kept solely for calving, acts as an absolute hot-bed for the causative organisms of the three calf diseases. Another method of prevention is the tying of the navel cord of the new-born calf with silk or other substance that has been soaked in tincture of iodine, and then after cutting the cord ½ inch below where it is tied, paint the stump, the cord, and round the entrance to the body cavity.

Good hygienic surroundings and cleanliness for calves will go a long way in minimizing the risk of hair ball. Lice or other skin parasites cause the young animals to bite and lick themselves, with the result that hair is taken in, and so forms a beginning for this condition. Indigestion caused by overgorging with milk also gives rise to it. Scouring may appear in young calves from overgorging. A tablespoon or two of castor oil is usually sufficient to rectify this state. If not, powders containing bicarbonate of soda, grains 3.0 (enough to just cover a 3d. piece), and bismuth salicylate, grains 15, are very effective. For scouring that does not answer to these, dried blood, an eggspoonful, will be found useful. Castrations can be carried out with much less risk from flies at this time of the year.

July in the Orchards—Planting.—This month is generally accepted as the correct time for planting all deciduous fruit trees. When the trees are received from the nursery, especially after a long journey by rail, the roots should be placed in water to enable them to swell out before planting. The holes for planting should be broad and sufficiently deep to prevent cramping of the roots. Do not mix manure in the holes unless the soil is known to be very poor. If manure is necessary, add a double handful of fine bonemeal or superphosphate, and mix it thoroughly with the soil. The

roots should be examined and all broken or badly barked pieces removed to minimize the risk of fungoid disease attacking these points. When carrying trees about prior to planting, have the roots enclosed in a wet sack to prevent drying out. Never plant too deeply, always a little higher than one would like; later on, the soil settles down and the trees go down too. Before completely filling in the holes with soil, give each tree a thorough soaking with water, at least 8 gallons, then fill in with dry soil. After the trees have been firmly planted, the stems should be cut back to the height of 15 to 18 inches above the ground to give a good shape and establish a vigorous root system. Never plant closer than 20 feet each way, 22 feet apart is better.

Pruning must be pushed on and completed as early as possible. Many of the earlier peaches will be bursting into blossom this month, and spraying must be finished to prevent blossom injury. All necessary information regarding pruning may be obtained from back numbers of the *Journal* or the bulletin "Pruning of Deciduous Fruit Trees," obtainable from the Department of Agriculture, Pretoria. (Price, 3d. prepaid.)

Spraying.—Most fruit trees are attacked by some insect pest or fungoid disease during the year. As a general rule, these ailments appear when the trees are in leaf and control measures are difficult to apply. If after pruning is finished a good clean-up spray such as "Capex" brand lime-sulphur solution in the proportion of one part "Capex" to ten or fifteen parts of cold water is applied, most of the troubles would be considerably reduced. Spray with bordeaux mixture to control fungoid disease, but it is of no use against aphis or scale. The Department has a number of bulletins dealing with tree ailments, which may be obtained on application.

GLEN, ORANGE FREE STATE.

Vacation Instruction.—An arrangement has been made for four students from the institution to spend part of their vacation in the Wargundy Orchards pruning trees, the terms being free board and lodging and rail fare in return for the work done. Some remuneration will be paid depending on the satisfaction given. This arrangement is excellent in every way, especially from the point of view of the institution providing as it does a means of the students gaining more extended experience. It is hoped that this feature of the work will extend in succeeding years, and that it may be possible for the greater proportion of the students to find work and gain experience on other farms during their vacation. Correspondence with any farmer interested will be welcomed.

Sun Scald in Trees.—As sun scald is so prevalent in the Orange Free State, growers who intend planting fruit trees are advised to head or prune back apple and pear trees on the main stem to about 15 inches and stone fruit, such as peaches, etc., back to 18 inches. For the following three or four years great care and attention must

be paid to laying the foundation of the trees by cutting back to form a cup or vase shaped tree with several low branches to protect the main stem from the sun.

The sun shining on the bark, especially the north and north-west side of the main stem, seems to heat up the sap in the cambium layer and to cause cracking. Then the sun opens out these cracks gradually, and the whole of that side of the stem dies. The cracking spreads up to the branches on the side of the tree affected causing them to die back, leaving an unsymmetrical specimen. Growers frequently attribute this to the work of pests of various kinds.

When a tree is very bad with sun scald very little can be done with it, and the best advice is to uproot it and plant another. If only slightly damaged, the tree can be cut back below the scalding and grafted over if the stock is suitable for this purpose.

New Feeding Stuffs.—Various by-products useful as concentrated feeding stuffs for live stock are now appearing on the market in increasing numbers. The more recent are cotton seed and linseed cake, and various maize by-products such as maize oil cake. South African rations in areas where lucerne is not grown to any extent are notoriously deficient in protein, and the production of these feeding stuffs in larger quantities is an encouraging sign that farmers are now devoting more attention to the all-important question of balanced rations. It seems necessary to emphasize, even at the risk of repetition, that if a ration is deficient in protein, the constituents present are not utilized economically, and a certain proportion of the food is then fed to waste.

Experimental Results.—An experiment was carried out at Glen during the past season to determine the relative effect of various methods of treatment of giving crops, viz., cultivation, harrowing, weeding, moisture tests being taken in conjunction with the records of weight of crop harvested. Owing to the insufficiency of the rainfall—no rain of value having fallen after the middle of January—the plants in the test plots did not properly mature, and the results therefore were not as complete as hoped. Two plots, however, gave outstanding results, viz., the fallow plots contained nearly as much moisture as the plots under crop, and the plots neither weeded nor cultivated in any way after the seed was planted gave about 25 per cent. lower yield than the plots to which attention was given.

Exhibit at Frankfort Show.—An innovation was made this season by sending a small exhibit of cereals and feeding stuffs and of demonstration experiments in soils and fertilizers and feeding stuffs to the Frankfort Show, with the chemist in charge to explain matters and answer questions. The plan was thoroughly justified, the exhibit not only attracting considerable interest, but the visitors to the show plied numerous questions, and the feature as a whole excited very favourable comment from all concerned. It is felt that an extension of this work should be made as far as circumstances permit.

At the small shows the attractions are more frequently too few than too numerous, and the visitors are willing to learn and, further, have plenty of opportunity for so doing. As a feature of extension work, the exhibit at country shows deserves to be extended.

The Value of Silage.—A drought such as we have experienced this year should be an incentive to farmers to make provision for the lean years by having a good supply of sileage on hand. The wintering of cattle is always a matter of importance to the stock farmer. The cattle will do much better if, in addition to the veld grazing, they receive some silage. Dairy farmers especially should not allow their cattle to come down much in condition, and this is of special importance in the case of young in calf heifers, since their growth will be stunted considerably. Succulent food such as silage and roots will do much to stimulate milk production in the cold months when the milk flow is dropping considerably.

Special Course in Poultry Farming.—During the past five or six years there has been a constant and increasing demand for special instruction in poultry farming, but shortage of staff and lack of facilities have hitherto made such a special course impossible.

Many people are now turning their attention to poultry farming as a means of livelihood, and in many cases these people are of mature age, and the two-year diploma course is not to their liking. Moreover, the object in view in the diploma course is to impart such information as will be of value to those keeping poultry, as they are ordinarily run on the farm, viz., as a sideline. The applicants for special instruction in poultry farming require special information to enable them to run poultry as a business, i.e. on commercial lines, and the equipment and method is very different in this case from that of the ordinary farmer.

The need for a special poultry course is therefore great, and fortunately the obstacles that hitherto stood in the way have now been removed, and it is proposed to commence the first course as advertised on the 24th July. The major part of the instruction will be given by the Lecturer in Poultry and his assistants. Lectures will, however, be given by the officers of the institution in horticulture and botany, in field crops, in agricultural engineering, and carpentry, in anatomy of the domestic fowl and poultry parasites, in book-keeping, and in feeds and feeding in so far as these pertain to poultry farming. The course is, therefore, complete, and it is anticipated that the applications will exceed the accommodation.

ELSENBURG, MULDERS VLEI.

The Avoidance of Codling-moth Infestations.—Codling-moth is a much more serious pest in South Africa than in California. In the latter country by far the greatest majority of pears are of the Williams or Bartlett variety,* an early ripening fruit, which is harvested before a complete second brood of the insect develops, with the result that where the Williams crop is harvested there is in most cases no fruit left in the orchard in which codling may breed, consequently the majority of the moths die without having increased their progeny. This results in a much lighter infestation to start with the following year. But in South Africa, the great majority of fruit growers, if not all, have at least six varieties, the Williams forming at most no more than one-sixth to one-quarter of the crop, the rest mainly comprising such varieties as Comice, Kieffer, Louise Bonne, Winter Nelis, and Glou Morceau, all of which do not escape even a third brood of codling larvae.

The Selection of Pear Varieties for the Orchards.—Fruit growers contemplating the establishing of new orchards would do well to consider the separation of the early ripening from the late maturing varieties of pears and apples, the former to comprise one orchard, the latter to make up another orchard, each planted preferably as far apart as possible. Such an arrangement would facilitate greatly the control of codling moth. When Williams, Clapps Favourite, Duchesse, Beurre Hardy, and other early varieties, forming a section of the orchard, are harvested, most of the larvae that have previously left the fruit ultimately develop into moths which fly to the trees of nearby areas of the orchard that are bearing later ripening pears, thus adding to their infestation. Williams, Beurre Hardy, and Duchesse pears were harvested at Elsenburg in 1922 on 25th and 31st January, and 7th February respectively; in 1921, on 27th January, 6th and 10th February respectively. Very few larvae leaving the fruit before 4th February, hibernate, and the majority do not hibernate until the middle of February (see Table I) but they develop into adult moths which must deposit their eggs on trees bearing fruit if their progeny are to survive.

The fruit grower, then, should see to it that early ripening fruits are picked promptly, not only to lessen the infestation the next season in such varieties, but also to prevent as many larvae as possible from leaving this fruit to develop into moths, which will concentrate on trees in the same orchard bearing later fruits.

TABLE I.

Records of Hibernating of Codling Larvae collected from Tree Bands, Mulder's Vlei.

Date Collected.	No. of Larvae Collected.	No. of Larvae which Hibernate.	No. of Larvae Developed to Moths in Fruit Season.	No. of Larvae which Died.
2nd December ...	151	1	89	61
2nd " ...	645	4	381	260
14th " ...	1,266	17	562	687
16th " ...	134	3	87	44
24th " ...	370	5	59	306
3rd January ..	419	16	145	258
13th " ...	325	8	91	226
25th " ...	334	13	130	191
4th February ...	690	96	170	424
10th " ...	138	32	22	84
22nd " ...	450	109	35	306
4th March	23	23	—	—
11th "	31	31	—	—
13th "	160	160	—	—
27th "	63	63	—	—

* *Literature cited.*—California Monthly Bulletin of Horticulture, Vol. VII, May, 1918, p. 239. "Pear-growi g in California," by Weldon. Weldon states "Probably between 80–90 per cent. of all pear trees in California are Bartletts (Williams B.C.)"

Spraying and Dusting for Control of Fusicladium, Season 1921-22.—The following is a brief summary of the work carried out during the past season in the pear orchard:—

Variety: Louise Bonne.

Plot I (average count of two trees).—Dusted twice with 12 lb. copper sulphate and 88 lb. lime before blossoming, and twice with the above mixture, plus lead arsenate, using 10 lb. $CuSO_4$, 75 lb. lime, 15 lb. lead arsenate, and three times with lime and lead arsenate, viz., 85 lb. lime and 15 lb. lead arsenate.

Total fruit, 1203; fusicladium, 137; codling, 636; percentage scab, 11.3; percentage wormy, 52.

Plot II (two trees).—Sprayed twice before blossoming and twice after (De Beers bordeaux) with usual sprays of lead arsenate.

Total fruit, 2000; fusicladium, percentage scab, 3.7.

Plot III (three trees).—Sprayed with ordinary bordeaux (4:4:50) twice after blossom with 1½ lb. lead arsenate in 40 gallons bordeaux of 4:4:50 strength, plus three sprays 1¼ lb. lead arsenate in 40 gallons water.

Total fruit, 2424; fusicladium, 109; codling, 179; percentage scab, 2.6; percentage codling, 5.

Plot IV (three trees).—Sprayed twice before blossom, Capex (1:45), and twice after, Capex (1:50) with 1½ lb. lead arsenate in 50 gallons water. Last three sprays 1¼ lb. lead arsenate in 40 gallons water.

Total fruit, 4230; fusicladium, 112; codling, 214; percentage scab, 2.6; percentage codling, 5.

Check Tree.—Unsprayed.

Total fruit, 391; fusicladium, 169; codling, 280; percentage scab, 43; percentage codling, 71.

Variety: Forelle.

Three plots, plus a check tree, were taken.

Plot I (two trees).—Sprayed twice before blossom, bordeaux (4:4:50), twice after blossom with 1½ lb. lead arsenate in 40 gallons bordeaux, and three later sprays 1¼ lb. lead arsenate in 40 gallons water.

Total fruit, 1301; fusicladium, 76; percentage scab, 5.8.

Plot II.—Sprayed twice before blossom with Corona bordeaux powder, and twice after blossom with similar mixture.

Total fruit, 1843; fusicladium, 100; percentage scab, 5.8.

Plot III (two trees).—Sprayed twice before blossom with Capex (1:50), twice after blossom with 1½ lead arsenate in 45 gallons Capex.

Total fruit, 1116; fusicladium, 9; percentage scab, 8.

Check Tree.—Total fruit, 383; fusicladium, 83; percentage scab, 21.

Conclusions.—(1) Infestations of fusicladium, in so far as Elsenburg is concerned, were not sufficiently severe to give very reliable results regarding the tests of efficiency of the different sprays and powders. (2) De Beers bordeaux powder, made up into spray form, is as effective as ordinary home-made bordeaux. (3) Capex

(1:45 or 1:50) is as effective as bordeaux, but causes a little burning of the foliage, although not sufficient to affect the fruit crop. (4) The seasons 1920-21 and 1921-22 have shown very markedly that the times of application of the sprays for the control of disease should vary with the seasons, and meteorological data, especially in respect to temperatures and rainfall, would greatly assist in the economy of carrying out the spraying operations.

It is quite possible that the two sprays before blossoming were unnecessary for the 1921-22 season at Elsenburg. Worse infestation of fusicladium appeared during this season after the fruit was removed. A similar occurrence happened in the Paarl district with regard to the control of *oidium*. The worst infestations appeared on the foliage after the crop had been picked.

It would, therefore, seem that our present recognized times of applying treatment may be at fault in so far as fusicladium is concerned, and that with more definite knowledge of weather conditions at certain times during the season, it may be to the best advantage to omit one or two sprayings, or with adverse weather conditions, it may be wise to apply an additional spraying.

No literature appears to have been published on this aspect of spraying, and in conjunction with the entomologist, meteorological records are now being noted from month to month.

Citrus Export: New Regulations.

The Trade Commmissioner states that in view of the numerous complaints made during the last citrus season in regard to the grading of oranges, he circulated among those concerned in the trade in London copies of the new regulations, which were published in the May, 1922, issue of the *Journal*, and that, as far as he can ascertain, these regulations meet with general approval, the trade being of opinion that if they are strictly enforced the confidence of buyers will be increased and the trade generally benefited by the higher standard of quality of fruit that may be expected to result therefrom.

Fruit Exports.

Fruit shipments for overseas for the month of May, 1922, were as follows:—

Citrus.—Oranges, 2177; grape fruit, 482 boxes.

Deciduous, etc.—Grapes, 2629; pears, 1650; persimmons, 58; apples, 2132 boxes.

Total fruit shipments from all ports during the season:—December, 1921, 4688; January, 1922, 164,168; February, 135,216; March, 326,262; April, 88,933; May, 9128. Total, 770,595 boxes.

Dried fruit (to England)—Raisins, 23,080; sultanas, 5856; peaches, 430; prunes, 1500; dried grapes, 6541; apricots, 75; (to New Zealand), peaches, 118; nectarines, 76; apricots, 75. Total for the month, 37,936 packages.

POTATO CULTURE.

By G. J. BOSMAN, B.Sc.Agr., Technical Assistant, Department of Agriculture.

HISTORY AND ORIGIN.

THE natural habitat of the potato is on the plateaux of Chile and Peru, where the plant is still found growing wild. It was brought from there by the Spaniards during the sixteenth century, and introduced into Europe. Its cultivation as a world's crop, however, did not become general until the latter half of the eighteenth century.

IMPORTANCE OF CROP AND WORLD'S PRODUCTION.

It is estimated that the potato constitutes about one-fourth of the daily food of European nations.

It is one of the chief items of food on the bill of fare of the poor as well as the rich. To some extent it is also used as stock-food. In European countries starch, alcohol, glucose, and syrup are manufactured from it. Potatoes are also frequently used as an ingredient in bread making.

Only the eastern natives who subsist mostly on rice do not use it. The potato can rightly be called the " King of all Plants "; a greater quantity of it is produced than of any other crop, as the following figures taken from *The Potato*, by Gilbert, will indicate:—

TABLE I.

World's Production of the most Important Crops: 1908-1912.

Potatoes	161,000,000	tons.
Maize	128,380,000	,,
Wheat	106,000,000	,,
Oats	65,600,000	,,
Rice	*55,600,000	,,
Rye	57,000,000	,,
Barley	33,410,000	,,

The six leading countries and their average annual production for the years 1911-1913, and their average yields per acre for the years 1904 to 1913, are given by Gilbert as follows:—

TABLE II.

Country.	Total Production in Bags.	Average Yield in Bags per Acre.
Germany	566,275,333	66.9
European Russia	419,373,444	35.4
Austria-Hungary	214,049,666	44.8
France	166,507,888	43.4
United States of America	116,101,000	32.1
Great Britain	86,494,000	70.

* This figure does not represent the rice crop of the world, as statistics from certain parts of China are missing.

Europe produces about 90 per cent. of the world's supply of potatoes, more than half of it being grown in Germany and Russia. Africa can be credited with only .09 per cent of the total production.

SOUTH AFRICA'S PRODUCTION.

The table which follows, compiled from the 1919-1920 agricultural census returns, shows the total number of bags of potatoes grown in each Province of the Union. For purposes of comparison the total production in bags of the two chief cereal crops is also given:—

Crops.	Cape.	Natal.	Transvaal.	Orange Free State.	Total.
Potatoes ...	291,000	134,920	521,870	303,130	1,250,920
Wheat ...	1,118,500	4,560	285,050	130,610	1,538,720
Maize ...	502,800	1,442,540	3,923,000	3,500,740	9,369,080

From the above, it is evident that the potato ranks only third in importance among the crops produced in the Union. It is likely to remain so as our present market for the crop is confined to the local trade, which is limited in extent.

Below is given the two highest producing districts in each Province, and the quantity produced by each of them:—

	Quantity Produced in Bags.
Humansdorp, Cape	20,880
Stellenbosch, Cape	18,240
Newcastle, Natal	24,455
Estcourt, Natal	17,220
Thaba 'Nchu, Orange Free State...	87,380
Ladybrand, Orange Free State... ...	47,550
Bethal, Transvaal	140,790
Middelburg, Transvaal	47,550

The above figures show that the outstanding district for the Union is Bethal.

The percentage of the total production grown under irrigation is difficult to estimate, but it is safe to assume that most of the potatoes are grown as a summer crop on dry-lands.

YIELDS.

According to the census returns the average yield per acre for the Union for 1911, was 1½ tons, and for 1917-1918, only 1 ton. On the high veld of the Transvaal average yields of 60-70 bags (4 to 5 tons) are not uncommon, and farmers growing the crop under irrigation always reckon on getting at least 10 bags from one planted.

CLIMATIC REQUIREMENTS.

The climate of the Union as a whole, with the exception of that of a few favoured areas, is not well suited to the production of this

crop. The summer heat in most localities is too great, and the rainfall often too irregular. Potatoes require a cool damp climate for the highest yields. Where such a climate obtains, the crop thrives well. Our climate is undoubtedly mainly responsible for our low average yield of one ton per acre. This statement is corroborated by the fact that although the crop does well in the low veld districts, Barberton, Zoutpansberg, etc., during the winter and early spring months, it does not thrive there at all as a summer crop. It is noticeable that where the summers are comparatively cool, and the rainfall fairly regular, as for example in the Bethal and Thaba 'Nchu Districts, potatoes do exceedingly well. Probably the highest yields per bag and per acre are obtained on top of the Haenertsburg Mountains, 36 miles east of Pietersburg. In this particular locality with its high altitude, the climate is always cool, and the rainfall high and fairly regular. While hot, dry weather is very detrimental to the crop, excessive moisture is as harmful by causing the crop to get "drowned" or to decay in the ground.

SOIL REQUIREMENTS AND ITS PREPARATION.

The crop is grown with more or less success on a wide range of soils. The ideal one, however, appears to be a naturally well drained, deep, friable loam containing an abundant supply of well decayed organic matter. Most of the potatoes grown in the Union to-day are grown on sandy loams, varying in colour from "vaal" to red. They do well on virgin or newly "braaked" soil, provided a good fine seed-bed has been prepared. When grown on very sandy soils, it is necessary that the soil receive a green manuring and liberal applications of fertilizers, or a good dressing of kraal manure.

On the preparation of the seed-bed depends largely the success or failure of the crop. It is no secret that the potato demands more thorough cultivation than most farm crops, and will give the highest returns for it.

The ploughing, where possible, should be deep and thorough, so as to produce a deep, mellow, moist seed-bed. In the potato areas of the Union, e.g. Bethal and Thaba 'Nchu, farmers report that they plough the fields intended for this crop, from 9 to 12 inches deep. At Bethal the land is ploughed at least twice before the crop is planted—once during the winter months, and again in spring at the time of planting—while at Thaba 'Nchu, three ploughings, including the one at the time of planting, are not unusual.

PLANTING.

There are at least two methods in vogue in the Union, namely, the "ridge" and the "flat" systems. In the former the tubers are planted in furrows or drills previously drawn with a ridging plough after the seed-bed has been prepared. In the latter method they are planted between the second and third share or disc of a three-furrow plough, or else in the second furrow of a two-furrow plough followed by a single-furrow plough to cover up the seed.

Most of the seed is planted by hand as machines have thus far proved unsatisfactory. The sets are placed either slightly to the right

in the furrow where the trek animals cannot trample on them, or else they are dropped in the furrow between the hind oxen and the plough, or better still, from the seat of the plough between the second and third share or disc of a three-furrow plough.

"The ridge" system is recommended under irrigation and where the crop is likely to experience a wet season. In the former case ridging facilitates water-leading, and in the second it affords drainage.

On dry-lands the "flat" or level system will in most cases prove to be the most useful and profitable one, as it will assist in conserving moisture.

About 4 to 5 inches, depending on the nature of the soil whether sandy or otherwise, is the correct depth to plant. The tubers should be planted deep rather than shallow, so that the subsequent harrowings which the crop is to receive, will not disturb them.

The rows are generally made 3 feet apart, and the sets dropped from 14 to 18 inches apart in the row. In the Bethal District the rows are made from 3 to 3½ feet apart, and the sets are placed on an average 14 inches apart. In the Thaba 'Nchu-Ladybrand area, the rows are made 3 feet apart, and the sets are dropped from 18 to 36 inches apart. Under irrigation at Petrusburg in the Fauresmith District, where this crop is grown on an intensive system for seed production, every furrow is planted, thus making the rows about 14 to 15 inches apart, and the tubers are placed 12 to 15 inches apart in the row.

The time of planting varies with the locality. On the high veld of the Transvaal the crop is put in from the 15th August to the end of November; in the eastern Orange Free State during November and December; while under irrigation in the Transvaal and Orange Free State August and September is the time for the early crop, and again from January to the beginning of February for the second crop.

In the low veld districts of the Transvaal, e.g. Koedoes Rivier and Barberton, where little or no frost is experienced, the crop is planted in June and July, so as to be ready for the early market in October, when fresh potatoes always demand top prices.

As potatoes will come up from three weeks to a month after they have been planted, depending on how well they were sprouted, and on the temperature of the soil, one could plant them for an early crop so that they would come up just in time to escape the late frost, the date of which each farmer should more or less know for his locality. If there are any signs of frost with the potato crop above ground, the ridging plough should be run between the rows, and the young plant lightly covered over with soil. Under irrigation with the crop in a more advanced stage a thorough irrigation on the day before frost is expected will help it considerably against damage from that source.

CULTIVATION.

If the land is inclined to be weedy, it is necessary to harrow it once or twice after the crop is planted, and before the latter comes up. This operation may be repeated several times while the crop is still young and unlikely to be injured. It should be done across and

not with the rows, else a number of plants might be damaged. Harrowing is very effective in keeping the weeds under control, and in destroying any hard crusts that may form.

Cultivation should start as soon as the harrow can no longer be employed. This operation should be continued until after the flowering stage. At that period the crop should be ridged or earthed up so as to cover up the tubers, and protect them from frost and tuber moth injury. Ridging is sometimes done gradually—a little earth being thrown towards the row with each cultivation.

As to the number of cultivations that should be given, no hard and fast rules can be laid down, but the grower should be guided by soil and climatic conditions. The same applies to the number of irrigations when the crop is grown under irrigation. The crop should be kept well supplied with moisture, otherwise malformed tubers will result. Experience has shown that water should not be applied during the heat of the day as this practice predisposes the crop to disease. Water-leading, therefore, should take place early in the morning or in the evening when the soil, the plant, and the water have about the same temperature.

MANURIAL REQUIREMENTS.

The potato is classed among the plants called surface feeders, and is also a short-lived crop, and for these reasons the soil intended for same should be in a high state of natural fertility, otherwise heavy applications of manures and fertilizers should be given to stimulate and promote growth. It does not pay to attempt to grow potatoes on poor soils. Of all crops the potato requires a very rich soil for maximum yield.

Results obtained by growers show that the following applications of manures have given satisfactory results:—

Ten tons of well rotted kraal manure ploughed under, preferably during the winter months so as to give it ample time to decompose thoroughly, together with 300 lb. of bone-dust or superphosphate which should be applied in the row on the day of planting.

The potato growers in the Bethal District use from 600 to 900 lb. of potato fertilizer per acre, and no kraal manures, whereas the farmers in the Fauresmith District use from 10 to 12 tons of sheep manure, and no artificial fertilizers of any description.

The experience at the different experiment stations in the Union has been that a combination of kraal manure with mineral fertilizers has given much better results than either alone. The organic matter seems essential for successful potato propagation.

The following Co-operative Experiments planned by Mr. T. D. Hall, Research Chemist, at the Experiment Station, Potchefstroom, and carried out by Mr. G. S. Leslie, Secretary of the Marico Agricultural and Stockbreeders' Society, contains some illuminating results on this subject. It will be noted that complete mineral fertilizers (plot 16) gave no better result than 8 tons of kraal manure per acre by itself. The best yield was obtained from 400 lb. superphosphate, 400 lb. of wood ash, and 4 tons kraal manure, and the next best with kraal manure and superphosphate alone. It would be as well when wood ash is not available to use in its place 80-150 lb. of sulphate of potash.

Co-operative Fertilizer Experiment at Zeerust.

Plot No.	Fertilizer Used.	Rate per Acre.	Yield per Acre.	
			Lb.	Bags.
1	Superphosphate	400 lb.	2,420	16·1
2	"	600 "	2,783	18·3
3	Kraal manure	4 tons	2,783	18·4
4	Control	No treatment	1,936	12·9
5	Kraal manure	8 tons	3,388	22·5
6	Superphosphate ... ... Wood ash	400 lb. 400 "	2,904	19·3
7	Superphosphate ... . Kraal manure	400 " 4 tons	4,598	30·6
8	Control...	No treatment	1,936	12·9
9	Superphosphate ... ... Wood ash ... ... Kraal manure	400 lb. 400 " 4 tons	5,082	33·8
10	Wood ash ... ... Kraal manure	400 lb. 4 tons	3,872	25·8
11	Wood ash	600 lb.	2,420	16·1
12	Control	No treatment	1,815	12·1
13	Wood ash	400 lb.	1,694	11·2
14	Sodium nitrate	100 "	2,178	14·5
15	Sulphate of potash	100 "	2,178	14·5
16	Superphosphate ... ... Sulphate of potash ... ... Nitrate of soda...	400 " 100 " 100 "	3,388	22·5
17	Control	No treatment	1,875½	12·5

The potato, like the tobacco plant, prefers a soil rich in potash. Fortunately, this element is found in most soils in sufficient quantities to supply the needs of the crop, but where a farmer has ashes on his farm he can apply same with advantage to this crop.

It is found that potatoes do well on acid soils, and for that reason the application of lime is not considered necessary, in fact, potato growers are of the opinion that lime is detrimental to the crop, in that it predisposes it to disease (scab).

ROTATION.

It is essential that potatoes be grown in rotation with other crops, otherwise diseases and insect pests peculiar to the crop will make the growing of same almost impossible.

The potato does well after a green manuring crop, as the latter leaves the soil in a loose state—ideal for tuber production.

On dry-land the following four-year rotation may prove useful:—

First year.—Maize.
Second year.—Teff, afterwards ploughed under.
Third year.—Beans fertilized.
Fourth year.—Potatoes, heavily manured as recommended above.

Or First year.—Maize.
Second year.—Maize fertilized.
Third year.—Cowpeas or kaffirbeans ploughed under.
Fourth year.—Potatoes fertilized.

In the potato belt in the high veld, this crop alternates with either maize and teff in the rotation, but no attempt whatsoever is made at green manuring with a legume. In the eastern Orange Free State beans, wheat, and rye are often included in the rotation.

Under irrigation the following two-year rotation may prove useful:—

First year:—

Winter crop.—Winter cereal, fertilized with superphosphate or bone dust.

Summer crop.—Beans for seed production or cowpeas ploughed under.

Second year:—

Winter crop.—Winter cereal, fertilized.

Summer crop.—Potatoes with kraal manure at the rate of 10 tons per acre.

SEED.

The amount of seed required to plant an acre will vary with the size of the sets, and the distances of planting. About 1000 lb. or from 6 to 7 bags of tubers, the size of a hen's egg (2 to $2\frac{1}{2}$ oz. in weight), is the average quantity planted.

On the quality of the seed planted, depends very much the failure or success of the crop. The seed should be sound, free from any disease, sprouted or ready to sprout. Provided the soil at the time of planting contains a fair amount of moisture, large tubers may be cut into halves, or, if very large, into quarters, leaving two or three eyes to each piece. It is advisable to cover the cut surfaces with ordinary lime, which will form a crust and thus prevent too much moisture from escaping. Cut seed should be put in soon after cutting, and should under no circumstances be planted in dry ground. On a whole very small tubers give disappointing results, especially if the season is unfavourable. Seed potatoes are generally stored in pits, pyramid heaps, or in sheds. Where dry winters are experienced the tubers are best left in the ground over winter, and lifted before they start sprouting in spring. They can then be spread open about 4 inches deep on the floor of a shed, and be turned over from time to time until required for planting. The most practicable method, though, for storing a large quantity of seed is to put it into mound or pyramid heaps. A cool, well drained spot is selected, and slightly excavated before the tubers are thrown into long heaps and well covered over with grass and straw to prevent them from being injured by frost, sun, etc. The pile should be examined now and then to see whether the tubers are not decaying. In the Bethal and Thaba 'Nchu areas most farmers store their seed very successfully in this way.

It is an undisputed fact that immature tubers give better results than those fully matured. Some farmers, therefore, lift their crop intended for seed before maturing, or if grown under irrigation they do not irrigate the crop towards the end, and thus cause it to ripen prematurely, which seems to have the same desirable effect as lifting the crop when still immature. Farmers often experience difficulty in getting potatoes from the crop planted in August to sprout in

time for January and February planting. Some growers are fairly successful by bagging their seed, and placing it in a warm moist situation, often lightly covering it with stable manure which will raise the temperature and cause the tubers to sprout. Care, however, should be exercised not to raise the temperature too high as the tubers are likely to decay. Potatoes grown in the low veld and lifted in October could be profitably used by the farmers for January and February planting.

IMPROVEMENT OF THE CROP.

It is the experience of many growers that potatoes degenerate if planted in the same locality, especially in a warm climate, for a number of years. The chief causes of this degeneracy or decreased productivity appear to be:—

1. Failure to select the right seed. Most farmers select their seed at the heap with the result that small tubers from low-yielding stools or hills are mostly selected. As like has a tendency to beget like, these small tubers will generally be responsible for low yields in the succeeding crop. This goes on from year to year, until the farmers find that their variety has "run out" or deteriorated. To remedy this, hill selection is recommended. The grower should select his seed in the field from the hills that yield most. If this is done for a number of years—always selecting the best from among the best—a highly productive strain which is not likely to degenerate could be developed.

Where experiments have been conducted with the progeny from high and low yielding strains it has been unmistakably proved that this character of the potato plant breeds true, hence the necessity of using tubers from productive hills.

2. Some investigators attribute degeneracy in potatoes largely to diseases carried in the tuber. The organisms causing the diseases have as yet not been isolated. Typical diseases of this character are: spindling sprouts, curly leaf, and mosaic disease.

As remarked above this so-called degeneracy can largely be counteracted by hill selection and by the use of sound, well grown tubers. There is always the tendency for the potato to revert back to its ancestors or to become "wild," and for this reason seed selection should be rigidly carried out and continued from year to year.

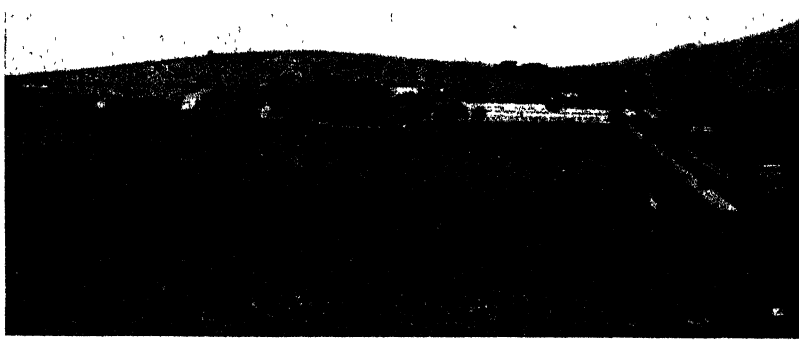
In selecting seed in the field it is well that the grower should keep the following points in mind and breed for same:—

1. High yield, ascertained by weighing, measuring, or counting the progeny from each hill.
2. Disease resistance; some plants easily succumb to diseases while others resist them.
3. Good keeping qualities; some potatoes keep well for a long time while others cannot be stored or kept for too long a period.
4. Good colour of flesh and skin; this depends on public fancy.
5. Skin of a desirable texture.
6. Tubers of good shape.
7. Shallow eyes and few in number.
8. Upright vigorous plants, showing constitution.
9. Trueness to type which varies with the variety.
10. **Maturity.**

HARVESTING.

The crop, unless intended for the very early market or for seed purposes, should not be dug until fully mature, i.e. after the skin is firm, and the tops have died down. It is usually lifted by hand, ridging plough, or potato digger. The last-mentioned implement is being used more and more. Grading, preferably into five classes, namely, large, medium large, medium, medium small, and small should be practised. The medium size potatoes are preferred to very large and very small ones for culinary as well as for seed purposes. On dry lands where the winter climate is a dry one the crop is best left in the ground, and lifted during the winter months when required for the market.

The months of August, September, and October are generally the time of the year when potatoes are scarce, and fetch the best prices on the market.



General View from Vineyard, Elsenburg School of Agriculture. Stables on right, Classrooms and Laboratories on left.

Drought-stricken Districts; Railage of Live Stock.

Reference was made in the May, 1922, *Journal* to the facilities given by the Railway Administration for the removal of cattle and sheep from drought-stricken districts for fresh pasturage, when full ordinary rates would be charged for the forward journey but one-half be refunded on the return of the stock to the original forwarding station, the return journey being free of charge. Certain conditions are laid down by the Administration in connection with this facility, and it is imperative that every farmer taking advantage thereof should strictly carry out his obligations. In the matter of whether the refund will be made where certain stock is sold and a portion only returned, it is pointed out that it will be paid in respect of the portion returned provided that the stipulated conditions of the promissory note are complied with whereby, before any stock is disposed of, arrangements are to be made to pay the Railway Administration the amount of the promissory note.

THE DAIRY COW.

By C. VAN FOREEST, Live Stock Officer, Department of Agriculture.

NOWADAYS, while everything produced on the farm is down in price and the farmer often finds it difficult to make both ends meet, it is absolutely essential to produce the best. This not only applies to agricultural produce, but also to cattle, both beef and dairy. When milk and butter-fat are high in price, even the cow that produces a small quantity of milk may be a payable proposition; now, however, it will only be the good producer that will show a profit. The more the milk yield, the greater the profit will be, as, though the cost of upkeep of the big yielder will be higher than that of the small yielder, upkeep and yield do not keep pace together. For instance, a cow yielding three times as much milk as another one may cost one and a half times, or perhaps even twice, as much in upkeep, but certainly not three times as much.

QUALITY TO BE SOUGHT.

The best test of course as to whether a cow is a good yielder or not is the bucket, and then her total yield over her lactation period, as it is not always the cow with a big flow of milk just after calving that will prove the best in the long run, but the persistent milker. There are three qualities a dairy cow must possess, viz.:—(1) Ability to stand the conditions under which she is kept, which means constitution; (2) ability, given a good sire, to produce calves of the merit of herself and to continue doing this for a number of years; and (3) a good milk yield.

The modern dairy cow is really a machine producing milk, and it may be useful to investigate how the machine is put together and which parts of the machinery are of most importance. From this study we will see that the shape of the dairy cow, as we want her, namely, wedge-shaped, seemingly rather narrow in front and broad and deep in the hind-quarter, is not a fad, but could not be otherwise, as those parts of the machinery which we want best developed are the cause of this shape. To go deeply into the question of how milk is made and the function of the blood and udder need not be discussed. Every one knows that a considerable part of the food consumed by a cow is converted into blood and that milk is made out of blood. For this reason we want a cow that will be able to consume a good deal of food. The more she eats the more blood and the more milk will be produced. Therefore we want a cow with a big barrel, deep, with well-sprung ribs. Given a cow with the above barrel, we will find that this corresponds with her mouth—a broad muzzle with strong lips, indicating the animal that is able to eat.

Another quality we are looking for in the dairy cow is a strong highly developed nervous system, as such an animal is able to perform more labour beyond what would be expected from appearances. Such

a cow will have a large intelligent eye and a broad forehead, showing well-developed brains controlling the nerves, and a strong, straight spinal cord. The spinal cord runs through the vertebrae from the head to the tail, and sends out from each vertebra branches that connect with the various organs of the body. Now, when the vertebrae are well apart and the back is straight, it shows that the animal has a strong spinal cord and is an indication of strong nerves.

[*Photo Med. Nederl. Rundvee.*

FIG. I.—Hindquarters of a Dairy Cow, showing good width between hocks; udder wide behind and well carried up towards pelvic bones.

As the digestive system and the milk secreting system are the two most important parts in the dairy cow, and are located in the back part of the animal, she necessarily takes a wedge shape, the sharp end of the wedge being in the front part of the cow. At the same time, however, we should not forget that we want constitution in the animal, and for that reason take care not to make our wedge too pointed, as for a good constitution we want a strong and well-developed heart and well-developed lungs. Therefore, an animal

with a deficient heart-girth, high though her production may be, is always objectionable.

We have mentioned the broad, strong muzzle as being an indication of feeding capacity. In that muzzle we look also for two big, open nostrils, which are an indication of breathing capacity, and as such of strong well-developed lungs.

THE POINTS OF THE DAIRY COW.

The whole of a dairy cow should have a refined, feminine appearance, long and wedge-shaped. In order to get this, the points to look for are:—

Head.—Rather long, not too wide between the horns, but widening out between the eyes, narrowing down again from the eyes towards the muzzle.

Muzzle.—Broad and strong with big, open nostrils.

Eyes.—Big, clear, and with soft expression.

Neck.—Long, thin, and practically free of dew-lap and joining an equally thin and bare shoulder.

Shoulder Blades.—Coming nicely to a point on the withers, but sufficiently apart at the base, giving plenty of room through the heart girth.

Back.—Strong, straight, with vertebrae well apart.

Hindquarter.—Broad and square in order to give room for the reproductive organs.

Ribs.—Long, wide apart, and well sprung.

Legs.—Of sufficient strength to carry the animal, placed squarely, and a square walk when in motion.

Udder.—High and full behind, and extending well forward under the belly, divided in four even quarters, free from fleshiness. When empty, it should nearly lose its form and consist of folds of soft pliable skin.

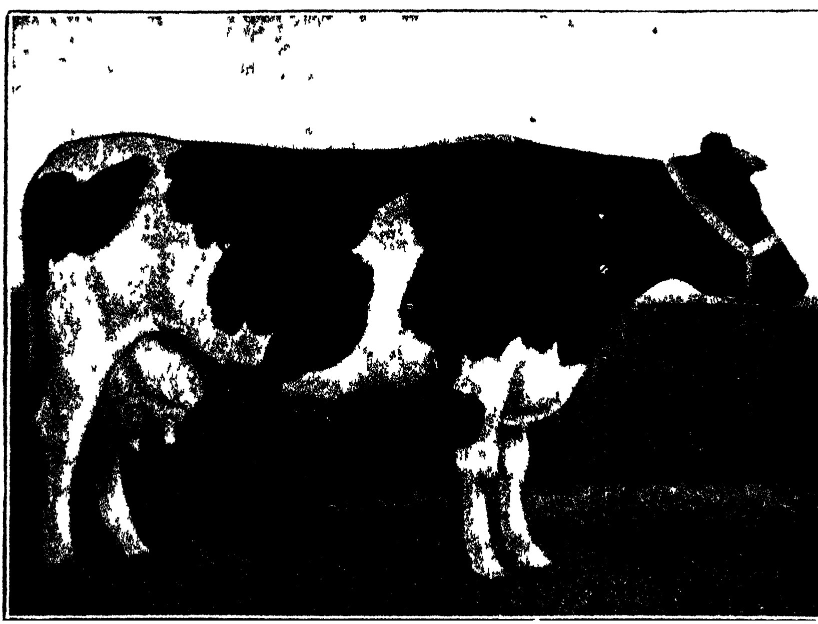
The udder that is not extending under the belly, but is placed in a sharp angle under it often points to the cow that may be a flush milker just after calving, but very seldom a persistent one. The cow of which the udder is not attached high behind very seldom is a good producer at all.

Teats.—Nicely shaped, medium size. The pointed teat, as a rule, indicates a cow that is hard to milk.

Milk Veins.—These should be thick, tortuous, and long, while the milk wells, through which the veins pass into the body of the cow, should be large. The artery that feeds the udder with blood from the heart is not noticeable, but runs under the spinal column; the milk veins—those that run from the udder forward under the belly—are important, as the size indicates the amount of blood that has passed through the udder. The milk well should be taken specially into consideration when the cow is dry, for at that time the milk veins are not so much in evidence, and a big well will indicate a good vein.

Hair and Skin.—The skin should be soft and comparatively thin, while it must be thickly planted with short, silky hair. Such hair and skin indicate the fineness of the dairy cow.

Escutcheon.—Must be high, wide, and spreading Viewing the animal from behind, the escutcheon is indicated by the hair on the thighs and the region of the cow above the udder, which runs up instead of down. It is supposed that the hair growing like that on those parts is due to the artery which passes there Though a well-developed escutcheon is not a sure indication of a good milker, it certainly is some indication, and in ninety-nine cases out of a hundred it will be found that the cow with the good escutcheon will also possess most of the points we are looking for in a dairy cow.



[*Photo Med. Nederl. Rundvee.*

FIG. 11.—A good type of Dairy Cow.

THE DAIRY BULL.

The points to look for in the bull are more or less the same as in the cow, only the animal should have a stronger appearance. A bull must have a manly appearance. Occasionally bulls are found, bred out of very high producing stock, that at a distance it is difficult to see whether it is a bull or not. Such a bull is too feminine in appearance as a sire. He may be of a good milking strain, but it is very dubious whether he will have the strength to stamp his progeny with his good qualities.

A thing to look for in the bull is the rudimentary teats, placed just in front of the scrotum. These should be well developed and squarely placed, being an indication that his heifers will have

nicely placed udders. Many farmers look for the cow with black or mottled teats, and for that reason for a bull with a black scrotum. Now the scrotum of the bull has nothing to do with the teats of his progeny. If cows with black or mottled teats are required look for the bull with the black or mottled rudimentaries.

Of course, for the farmer who wants to improve and who wants to be certain of what he is breeding, the only animal he can use is the pure-bred dairy bull. It is a recognized fact in breeding that the older and truer the blood, the more able is the animal to give his progeny the good qualities he possesses. Now the cross-bred or grade bull cannot have that strength, and the farmer using such an animal may, instead of improving, go backwards in the dairy qualities of his stock.

THE NEED OF THE DAIRY COW.

The great difference between the beef and the dairy type cow is that in the days of plenty the beef-type animal lays up a store of fat, and during the bad season when there is little to eat in the veld she is able to live a long time on her stored-up fat. Not so the dairy type. In the days of plenty she converts her food into milk, and when the bad times come she has nothing to fall back upon, and, of course, is bound to get in a poor condition. For that reason, and also because she wants a considerable amount of food to convert into milk, the dairy cow is an animal that has to be fed. The saying "the better you feed your cow, the better she feeds you" is a true one. Besides having a very highly developed nervous system, she requires good care and attention and kind treatment, and will react very quickly on anything to the contrary.

Plant Nurseries in Quarantine as at 1st June, 1922.

Name.	Address.	Cause of Quarantine.	Extent of Quarantine.
Mrs. A. W. Godwin ...	Durban	Spanish Red Scale	Palms.
		Red Scale ...	Roses.
		Araucaria Scale ...	Araucarias.
Hugh Horn	Parys	Pernicious Scale...	All deciduous stock.
A. E. Todd	Pietermaritzburg	Red Scale ...	All citrus.
W. Flynn	Somerset West ...	Woolly Aphis ...	All apple trees.
N. S. van der Merwe...	Wellington ..	Red Scale ...	All citrus.
J. S. Rossouw... ...	Wellington ..	Red Scale ...	All citrus.
C. F. Marais	Wellington ...	Red Scale ...	All citrus.
Badcock & Cunningham	Uitenhage ...	Red Scale ...	Whole Nursery (citrus).
Lovedale Institute ...	Alice	Red Scale ...	Lemon stocks.
F. P. Long	Clumber	Red Scale ...	Whole Nursery (citrus).
S. B. Bartlett... ...	Clumber	Red Scale ...	Whole Nursery (citrus).
F. N. Tarr	Bathurst	Red Scale ...	All citrus.
E. Krohn	Pretoria	Pernicious Scale White Peach Scale Rose Scale	Part Nursery.
D. A. English & Co. ...	Pietermaritzburg	Red Scale ...	Lemon stocks.
R. Mason & Son ...	Pietermaritzburg	Red Scale ...	Lemon stocks.

THE TANNING AND BRAYING OF SKINS AND THE MANUFACTURE OF RAW-HIDE LEATHER AND RIEMS.

By W. F. SCHLUPP, B.Sc., F.E.S., Entomologist, and G. C. MACKINNON, Field Instructor in Practical Agriculture, School of Agriculture and Experiment Station, Potchefstroom, Transvaal.

THE skins from the thousands of wild animals, large and small, that are killed each year in South Africa constitute, when taken in the aggregate, an agricultural item of no mean value.

The pelts of practically all animals are useful for one purpose or another—stoles, muffs, collars, coats, karosses, rugs, etc., being among the articles prepared from them. The most valuable skins are sometimes handed over to furriers by people living close to large towns. People living in remote districts often find this inconvenient; many others do not care to pay the difference in cost between the raw skin and the finished product.

The home-tanning and braying of skins is not a very intricate matter—it requires merely a little care and a certain amount of work. Farmers often make their own karosses and rugs, and, for that matter, occasionally very creditable stoles and muffs are produced on the farm.

Natives are generally quite adept at braying skins by the simple method used by all aboriginals, viz., by stretching, scraping, twisting, and rubbing the hide, together with the use of fat. This method often produces a good article; nevertheless, the employment of a good curing mixture or solution minimizes the chance of failure, and is considered to give a better finished product, there being less danger of the hair being lost. It should be borne in mind, however, that the use of such artificial aids does not eliminate the necessity for good hand-work; the latter is equal in importance to the tanning mixture used.

SKINNING SMALL ANIMALS.

In skinning a small animal, proceed as follows:—From each hind foot make a cut along the inside of the leg to the anus, and from there along the underside of the tail. Cut only the skin, not the muscles. Avoid rupturing the scent-glands, which, when present, are located near the anus.

Skin the hind legs; the claws may be left attached to the hide if desired. Next skin the tail. The skin may be split for a short distance along the tail, the rest worked loose with the fingers, and the tail vertebrae pulled out without splitting the remainder of the tail-skin. However, for the beginner at least, it is better to split the skin nearly to the end of the tail, as it often happens that, with the unsplit skin, the hair falls out, especially near the end. This is probably due largely to the fact that it is difficult to dry and cure properly the unsplit tail. After the tail has been skinned, suspend the animal by its hind legs and pull the skin down over the body (inside out), using the fingers as much as possible and avoiding the use of the knife except when necessary.

When the front legs are reached, work the fingers under them, between the hide and the flesh, and pull the legs out of the skin. When being pulled over the head the skin will stick fast when the ears are reached. If it is desired to remove the ears with the hide, make a cut an inch or more behind the point where the skin appears to stick. This will cut the ears loose at their bases. Similarly, when the eyes are reached, also make the cut a short distance behind the point where the skin appears to stick fast.

After removal, the hide is split down the middle line of the belly. In skinning large animals the skin is split down the belly as soon as operations are started, i.e. before it is removed from the carcass.

Skins from animals killed in winter are, as a general rule, more valuable than from those killed in summer. Not only is the fur and hair better, but it is less likely to fall out after the curing process is completed. To avoid deterioration of the hide it should be removed from the body as soon as possible after an animal is killed, especially in summer.

Pelts from animals that have been poisoned are of less value than those of animals killed by other methods. The poison appears to have some deleterious effect on the hide, and, in addition, the animal generally lies for a comparatively long period before it is picked up and skinned.

Green skins must not be allowed to lie undried too long or the hair will fall out. They should be either tanned at once or they may be salted and dried, and the tanning and braying done at a later date. Before the tanning mixture is applied, dry skin should be softened with warm water. If the hide is covered with blood and dirt it should be given a good washing with soap and water, especially if it is to be dry cured.

TANNING AND CURING MIXTURES.

Tanning agents of various sorts are in use. The simplest is a mixture of common salt and alum. Some farmers make use of wild plants. Others rely on proprietary preparations. Of the recipes which follow, the second is one which has been recommended by the United States Bureau of Biological Survey. The first and last are also of American origin, but have been slightly modified. The third is one which appeared several years ago in the *Union Agricultural Journal*.

For Very Small Skins.—This is one of the simplest kinds of curing mixtures. Take 2 parts of saltpetre and 1 part of alum and reduce to a powder. Saltpetre is best, but if none is on hand use salt as a substitute. Rub well the flesh side of the skin with the powder, taking care that every part is covered with the mixture. Lay the skin away in a cool place for several hours. In cold, winter weather it may be rolled up and left for a fairly long time. Next, stretch it and allow it to dry a little, then scrape it, and before it is entirely dry rub and twist it until it is soft.

For Small to Medium Sized Skins.—This is also a fairly simple recipe. It is recommended for small to medium sized skins, but it could be used for fairly large ones also. A solution has an advantage over a dry-curing mixture in that there is little chance of any part of the skin escaping its effects.

Dissolve 1 quart of common salt and 1 ounce of sulphuric acid in 1 gallon of water, preferably soft. Keep the solution in a glass, glazed earthenware, or enameled vessel. Ordinary metal vessels may not be used. The writers have made use of a clean, new, unrusted, and unscratched paraffin tin. At the end of twenty-four hours a considerable amount of chemical action between the solution and the tin had taken place. This might be very injurious to the skin, although in the writers' work no definite damage was noted. At any rate a paraffin tin should not be used except in a case of necessity. The sulphuric acid and the salt each have an effect of their own, and, in addition, they react to form a certain amount of glauber salts, which sometimes can be seen crystalized on the hair of the skin which has been soaked in the solution.

Soak the skin in the liquid for one day. No harm is done if the period is longer. Then wash the skin thoroughly with soap and hot water, rinse, wring out the water, rub the flesh side with a cake of soap, hang the hide over a cord, rope, or riem with the flesh sides in and leave until nearly dry. When the hair is dry, but the skin itself still slightly moist, scrape the flesh side well with a blunt instrument. This removes fat, bits of muscle, and other tissue, and leaves the skin nearly white. It is surprising the amount of fat that can be removed from some hides. Stretch the skin, but before it becomes dry rub, twist, and roll it until it is soft and pliable. If any part remains hard repeat the soaping and rubbing.

Another Method for Medium Sized Skins.—Make a strong lather with hot water and soap, wash the skin thoroughly in this, then soak for twelve hours or more (depending on the size of the skin) in a solution of 1 pound of salt and 1 pound of alum in 2 gallons of hot water. Hang the skin out to drain, with the flesh side inward. Then stretch the hide with the fur inward, and so that the air can pass beneath it. Before it is quite dry sprinkle the flesh side with a mixture composed of equal parts of powdered alum and saltpetre. When thoroughly dry scrape the flesh side with a blunt knife and rub it with pumice stone or fine sandpaper.

Mr. E. S. Buttermer, who published the above recipe, stated that he had always found it most excellent for the skins of sheep, goats, buck, and foals. When tanning larger skins the soaking in the salt and alum should be continued for a period longer than twelve hours.

To Tan Large Skins.—The following method requires a great deal of work, but it is a very good one for large skins. It is, of course, good for small ones also:—

Soak the skin in warm water, stretch, and thoroughly scrape the flesh side. Then apply a paste made of equal parts of saltpetre, borax, and glauber salts moistened with water; fold the skin, flesh side in, allow it to lie for twenty-four hours, then wash in warm water. Next apply to the flesh side a mixture made by melting together 2 ounces of good soap, 1 ounce of washing soda, and ½ ounce of borax. Fold up the skin and allow it to lie for twenty-four hours. In warm weather watch should be kept on the skin when it is lying folded.

Make up a solution by dissolving 1 pound of alum and 2 pounds of salt in a paraffin tin full (4 gallons) of hot rain water or other soft water. When the solution has cooled to the point that it does not burn the hands put in the skin and allow it to soak for twelve hours;

then take it out, wring it, and hang it on a rope or riem for another twelve hours. This last soaking and drying should be repeated until the desired degree of softness is obtained. The usual stretching, rubbing, and twisting completes the work.

Braying the Skins.—Reference has already been made to braying, which follows the tanning process. Braying consists of stretching, twisting, rubbing, and rolling the skin to make it soft and pliable. It also makes the skin much lighter in colour. In the case of skins of ordinary size the work is done with the hands. Large skins may be folded and trampling with the feet added to the braying procedure. Some of the tanning agents used tent to make the skin soft, but a certain amount of braying is necessary. In the case of large thick skins a great deal is required.

Although during the tanning process fat is scraped from the hide, fat is added during the braying process. It is, of course, applied only to the flesh side, none to the fur side. Its function is to soften the skin, which should be well rubbed so that the fat is absorbed. Fat is absolutely necessary in the case of large hides. Skins of moderate size require only a moderate amount; small ones require little or none. We have used a good grade of dubbin as a substitute for fat with satisfactory results.

THE HOME MANUFACTURE OF RAW-HIDE LEATHER.

The manufacture of raw-hide leather, and especially of riems, is a very common practice on many South African farms. Hides of various kinds are used, those from cattle and other domestic animals predominating. The work is done in summer, and also in winter if weather conditions permit.

(1) *Loosening the Hair on the Hides.*

Hair on the hides may be loosened by several different processes. One method consists of painting the hair side with a 30 per cent. solution of sodium sulphide, thickened with lime. The skin is then folded up, hair side in, and left to lie for a few hours, when the hair can be removed by scraping. In another process (a cheaper one) the skin is immersed in a vessel containing milk of lime. The liquid is stirred daily, and after a few days the hair on the skin becomes loose.

Many farmers, however, prefer the old-fashioned process, as they believe that lime has a tendency to cause brittleness in the hide, an undesirable quality, especially if the leather is to be used for voorslags. If a skin has been treated with lime it should be washed afterwards and then well soaked in a mixture of wheat bran and water to remove the lime. The methods described hereunder are those in vogue in the Western Province of the Cape, a region well known for the good quality of its raw leather. The latter is produced without the aid of chemicals.

The processes for loosening the hair are quite simple, and depend on the setting up of decomposition in the hide, which causes the hair to become loose. There is an element of danger in the procedure, as, unless the decomposition is checked at just the right stage, the hide is injured. It has been noted that the strongest leather is obtained from those skins from which the hair is removed with the greatest difficulty; in other words, from the skins which have undergone the least decomposition.

Several decomposition methods are in use. The time required for each is from one to two days in summer; longer in winter. A dried skin, which must be thoroughly soaked in water as a preliminary treatment, requires longer than a green one.

The Bag Method.—This is used for comparatively small skins, such as those from duiker and other small buck. The green, undried skin is rolled up, flesh side in, placed in a bag, and left until the hair can be pulled easily, at which time the skin must be removed at once from the bag. After the first day the hide must be watched carefully to prevent decomposition proceeding too far.

The Earth Method.—This is used principally for large skins, but sometimes also for small dried ones from which it is difficult to remove the hair. A small plot of ground is selected in a place exposed to the sun, free from ant nests, and preferably with sandy loam soil. An excavation about six inches deep and as large as the skin is made. The skin, which has been previously soaked until it is thoroughly wet, is spread out, hair side up, in the bottom of the excavation. The earth that was removed from the hole is then replaced on top of the skin and made fairly firm. The earth must be kept moist, so if the soil is dry water is added as required.

At the end of the first day a small opening is made and a test made by pulling the hair at the edge of the hide. The belly hair is the firmest; if it comes off easily the rest will also come away readily as a rule. After the first day tests are made at frequent intervals to avoid leaving the skin until it is damaged. Care must be taken to have the bottom of the hole as level as possible. If depressions are present the parts of the skin lying in them are very liable to go bad. The damaged parts will be found when the hair is being scraped off, as the hide will burst in such places.

Manure Heap Method.—The procedure is much the same as in the earth method. Old horse manure that is warm and slightly damp is used. The manure heap is leveled, the wet skin spread out, hair side up, and covered to a depth of six to eight inches with more manure, which is then made firm with the spade. At the end of twenty-four hours examinations of the skin are begun.

This method is used by some people, but is open to several objections. Aside from the fact that a very offensive smell is set up, the method is very likely to produce a blotched hide and a damaged one. It is difficult to prevent depressions being formed in the manure, the hair comes off in some spots sooner than in others, consequently the skin is liable to be left in the heap too long. About the only time when the manure heap is preferable to the hole in the earth is during cold winter weather.

The Bran and Water Method.—This is adaptable for any size of skin. The hide is simply immersed in a sloppy mass of wheat bran and water. As in the other methods, tests are made at the end of the first day to see if the hair pulls readily. A paraffin tin will hold a skin the size of that of a springbok; for larger skins a tub or similar vessel should be used.

The bran and water method is probably the best of any of the decomposition methods that have been described in this paper. Not only is there less of the objectionable smell produced than with the other methods—there is also less danger of the hide being damaged.

By using warm water and by keeping the vessel containing the mixture in a heated room it should be possible to make use of this method in the high veld in winter.

(2) *Removing the Hair from the Hides.*

After the hair has been loosened sufficiently by one of the processes just described it must be removed by mechanical means. From this point onward the work should be done *in the shade.* The uncured skin must not be left exposed to the hot sun for any length of time.

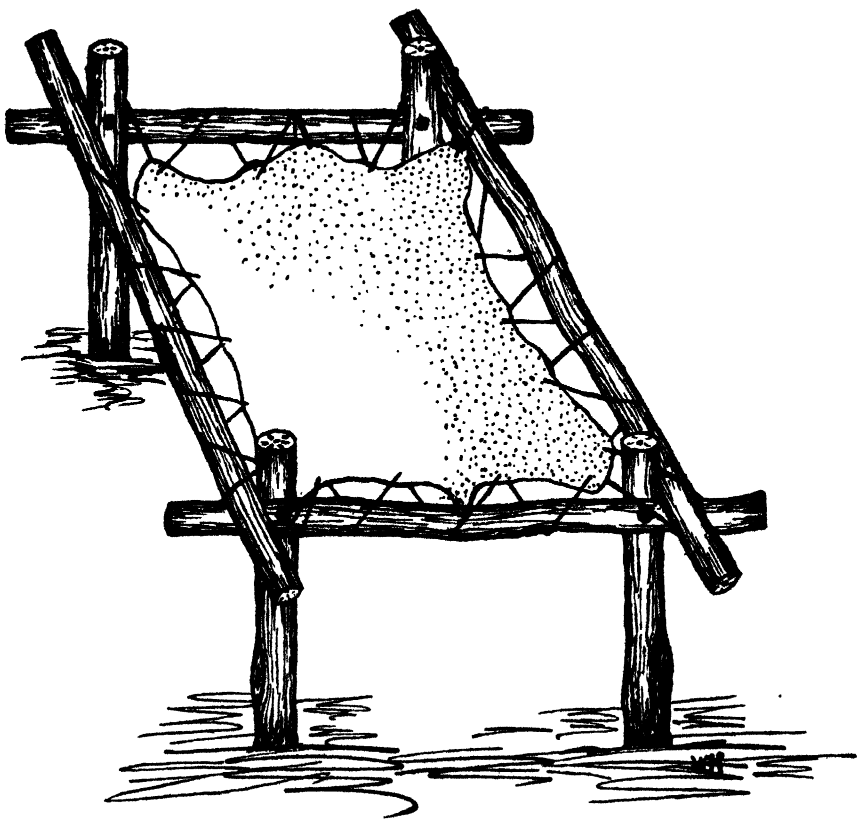


PLATE I.

Small Skins.—The skin is laid on a bag and one end fastened to the floor, or is held by some one. The flesh side is scraped with a blunt spade or with a plank until it is very clean and smooth. The skin is then turned over and the other side is scraped in a similar manner until the hair is all removed.

Large Hides.—Four posts are set in the ground and a frame erected—three or four feet high and large enough to hold the skin, as shown in the illustration. Holes are cut in the hide about two inches from the edge, after which the skin is stretched very tightly, flesh side up, and laced in the frame with riem or rope. A native stands in

the skin, and with a blunt-edged bush-pick or Dutch hoe, or with a dull spade, chops and scrapes the hide This removes fat, bits of muscle, and other tissue. It also dislodges a great deal of hair, which drops from the lower side. A considerable amount of force is employed in the chopping, but the skin gives when struck, therefor the hoe does not go through it, i.e. not unless the skin has been damaged and weakened during the hair-loosening process. After the work on the flesh side has been completed the skin is removed, turned over, and again laced tightly in the frame. The chopping and scraping, as already described, is carried out until the hide is free of hair.

(3) *Braying the Hides.*

After the hair has been removed the skins could be put into curing or colouring mixtures, but, as already indicated, the raw leather of the Western Province is produced without the aid of chemicals. It is whitish in colour.

Small Skins.—After the skin has been scraped clean it is washed in clean water and then soaked until thoroughly wet, after which it is brayed. A very small skin is worked with the hands, but a medium sized one is laid on a dry bag and trampled with the feet. The bag soon gets wet and must be replaced by a dry one. When the skin has been worked until only a slight amount of dampness remains in it, fat is added to the flesh side and braying continued until it is dry.

Large Hides.—After the skin has been scraped and removed from the frame it is washed lightly, merely enough to remove any soil clinging to it. A large hide is *not soaked,* because if it becomes saturated it requires a great amount of labour to work the water out again. After the skin has been washed it is rolled up and placed on dry bags, which are replaced by dry ones when necessary. A few coloured workmen are set to work trampling and dancing on the hide, vigorous action being necessary. After a couple of hours of this treatment the skin is nearly dry and begins to turn white. At this stage fat is rubbed on the flesh side of the hide, and trampling continued until it is worked through to the hair side. When this is accomplished it is an indication that the work has been well done. The hide is then hung up until next day, when, if it feels at all hard, more fat is added and the trampling process repeated. Almost any kind of fat is used, but, if the leather is to be used for harness, unsalted fat is preferred, as the presence of salt has a tendency to cause rusting of buckles and other metal parts.

RIEM-MAKING.

At the Cape, raw leather is prepared by one of the processes that have been described in the previous pages. The riems are then cut from this prepared leather. As a rule the Cape riems are very soft and pliable. In the Transvaal, Orange Free State, and other parts of the up-country riem-making is carried out in an entirely different manner. The hair is removed by one of the methods already described as being in use at the Cape, but after the skin has been scraped it is salted and left unbrayed. It is either cut into riems at once or else laid away in a shady place until wanted. If it becomes hard and dry it is soaked in water before being cut.

Occasionally riems are made from skins from which the hair has not been removed, but generally this is looked upon as a mark of poor or slovenly workmanship.

The riems are cut to the desired width, say one to one and a half inches. When cutting them it should be remembered that during the braying process they are stretched, and the finished article is slightly narrower and much longer than when first cut. The hide may be cut into strips of the required length, or it may be cut into one long single riem, by beginning at the outside edge and cutting around and around the hide until nothing remains.

The short riems are made into a bundle, one end of which is fastened to a limb of a tree. Similarly, a long riem is looped over a limb, and hangs down like a skein of wool. A stick of wood is passed through the lower end of the loop or fastened to the lower end of the bundle of short riems, and a heavy weight, such as a wheel from a buck-wagon or a stone weighing from thirty pounds upward (depending on the number of riems), is lashed to the piece of wood, as shown in the illustration.

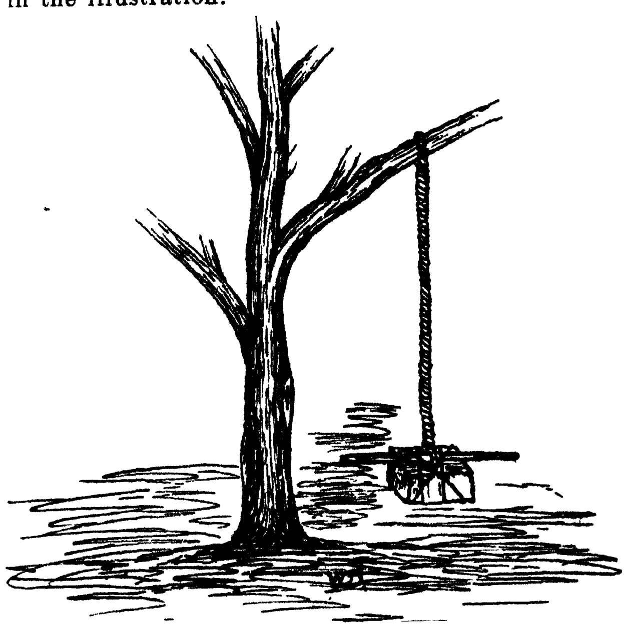


PLATE II.

The braying is then begun. The stick, with the attached weight, is turned around and around until the riems are twisted very tightly, somewhat like a rope. The stick is then released. The weight causes the twisted bundle of riems to unwind. The bundle is then twisted in the opposite direction and allowed to unwind. The alternate twisting in opposite directions and unwinding is kept up until the strips of hide are nearly dry and are becoming soft.

Fat is then applied and the twisting continued. As the fat works into the leather, more is applied if necessary. At the end of from one to three days the braying is finished. Sometimes, however, it is kept up considerably longer. The number of days required for the work depends on several factors, such as the condition of the skin at the beginning, the degree of softness desired, and the energy and persistence employed in the twisting.

MOHAIR.

The Future Demand and How to Meet it.

By B. G. L. ENSLIN, Chief, Division of Sheep and Wool.

THE attention of Angora breeders is invited to the following letters in connection with the mohair market received from Mr. S. B. Hollings, Editor of the *Wool Record*, Bradford, and Mr. Gilbert Watson, buyer of wool and mohair at Port Elizabeth and London.

(1) Mr. Hollings' letter:—

South African mohair will be claiming the attention of a large number of readers, the advent of the new clip causing interest to be centred in this article. Naturally, a large number are concerned over the future of prices, and what is likely to be made for the new summer clip. It also is an item of no small interest to a good many spinners and manufacturers on this side, for mohair is undoubtedly showing signs of a revival. This is not to be wondered at after at least six years of neglect, for the war dealt a deadly stroke to this article. Nothing else could be expected, in view of the fact that Germany was the chief outlet for mohair yarns spun from Turkey and Cape mohair. There certainly has been some revival, and signs are not wanting of a sensible recovery, and we think that South African mohair growers can look forward to better days. We should have liked things better if continental exchanges showed signs of recovery, and one must hope for an improvement after the Genoa Conference. The reader must clearly understand that commercial conditions in Germany and Russia are vitally connected with the future well-being of the mohair trade. If we are to see any radical improvement, Germany and Russia must begin to take mohair yarns from Bradford on a scale approaching that seen in pre-war days We should say that at least 75 per cent. of the mohair yarns spun in Bradford before the war were taken by the two countries named, and one must therefore look forward to Germany coming along and purchasing extensively before there can be any real radical upward movement of mohair values. Of course, Bradford spinners naturally say that the mohair yarn business can best be rehabilitated by prices remaining on a low level as is the case to-day, but the writer contends that a reasonable advance would not in the least jeopardize the future of the mohair yarn business. Merino wool is to-day considerably above pre-war times, and that is not affecting Germany's purchases in the least, and therefore we say that Germany could pay 1s. per lb. more for yarns without trade being injured in the least.

The demand is certain to be strong and well sustained for all fine quality hair, both kids and firsts. That will be the outstanding feature of the season's trade, and we do not think that any produce

broker need be the least concerned about the demand for this class of raw material. Forcing tactics need not be adopted, and if reports are to be relied upon, America will probably be in the market to a fairly large extent. America must have the best quality kid hair, as it does Australian merinos, and although the "agricultural block"—that is agricultural interests—are paramount in the American Senate, once the tariff is settled we may expect a considerable trade to be done in fine mohair, as well as in fine wool.

It is difficult to say what are likely to be ruling prices for mohair. Of course, fine kid hair will be at a premium, and can easily realize the top side of 30d., while summer firsts are worth in Bradford to-day all round 12d. for a good line. What we want to see above all is a good demand, and we think there are unmistakeable signs of development.

(2) Mr. Gilbert Watson's letter:—

We are on the eve of the 1922 summer mohair clip of South Africa, and I would be glad if you would direct that efforts be made to market the clip in a more marketable way than hitherto. I have not the slightest doubt that if growers would sort and classify their mohair to better advantage, the ultimate result to the farmers—certainly as a whole—would be financially better.

As you know, my firm buys a fair amount of mohair for the States and England, and with regard to last season's summer clip in particular I can speak from very bitter experience, in so far that we had to reject hundreds of bales entirely--not so much that the bales were entirely lacking in quality (fineness) as that they contained from a fairly small to a fairly large percentage of strong-haired qualities, which latter most of our clients had no use for whatsoever. Bluntly, very few, if any, firms to-day are in a position to buy something they don't want to enable them to buy something they do want.

I don't deny there are a few firms, they are in a small minority, I fear, who can do with and use strong hair at a price, but I am thoroughly convinced that to create a ready sale, which means the farmer being in possession of his money at an earlier date than otherwise (and I venture to add that South Africa can do with other countries' money badly), it will be well for farmers to sort, classify, and bale their mohair properly, so as to give all buyers a chance to select and buy in accordance with their orders. I am well aware that certain districts vary in production and/or growth, also that climatic conditions vary from season to season, but, speaking generally, I think that much can be done on the lines suggested, and it requires no great amount of brains and knowledge on the farmers' part to carry them out.

With reference to Mr. Gilbert Watson's letter on the urgent need for the proper classing of mohair by farmers, it is desired to point out that this course was strongly recommended by the Central Wool Committee in the report which they presented to the Government and published on the conclusion of the investigations carried out by them in September, 1918. The report dealt with the trade in wool, mohair skins, and hides in South Africa, and pointed out in what manner improvements could be effected in marketing the above produce,

The following is an extract of the recommendations made by the Central Wool Committee for the classification and preparation of mohair for the market:—

(1) *Classification.*

The practice in vogue to-day by a majority of growers of mohair in the classification of their produce leaves much to be desired. Little or no real classing takes place. The locks and stained pieces of the clip are removed, and the remainder of the fleeces, irrespective of quality, is thrown into the bale.

All growers of mohair know that the fleece from a young animal is finer than that from an older goat. The Turks recognize this, and it has been a practice for years amongst them to slaughter all animals on reaching the age of full mouth.

With a view to an improvement in the existing state of the mohair industry being effected, the following recommendations regarding the classification of mohair are given in the hope that mohair producers will recognize the advisability of following them:—

Kids' hair should not be allowed to remain too long on the animals. The longer the hair is allowed to grow the coarser it becomes. Therefore, it is a recommendation that as soon as kids have reached the age of, say, seven months they should be shorn. The hair from kids eight to nine months old should not be mixed with that from animals of six months of age and under. By these means uniformity in length and quality would be attained. All locks, seedy and stained hair, should be baled separately.

Summer firsts is the term applied to the main clip, which is usually of about eight months' growth, and is generally shorn in the month of May. For classification purposes it is recommended that this clip be divided into the following classes:—

(*a*) First fleeces to consist of hair from goats of the age of two tooth, and perhaps from some four, six, and even eight tooth animals, which may carry exceptionally fine fleeces of good length and quality. From these fleeces all locks, stained and seedy parts, coarse and short breeches, and hard necks should be removed and baled separately in their respective classes.

(*b*) Second fleeces to comprise skirted hair from four and six tooth goats, coarse two-tooth, and fine full-mouth animals.

(*c*) Third fleeces; this class should contain the skirted fleeces of all full-mouth ewes and kapaters, and from any coarse four and six tooth animals.

(*d*) The coarse and short breeches and hard necks removed from the three above-mentioned classes.

(*e*) Stained hair.

(*f*) Locks.

(*g*) Seedy hair.

Winter kids, usually shorn during the latter part of September or the beginning of October, is short in length, and classification should only be undertaken when the flock is very uneven in quality, in which case the finer and coarser grades should be separated.

Winter Hair.—To this class of hair the remarks about winter kids also apply. Hair from ewes that have kidded early is shorter than that from dry ewes and kapaters, and should be baled separately.

Mohair is put to various uses, and consequently fine and coarse hair have their respective places in the trade. If a clip is got up on the lines suggested, buyers would be in a position to bid their full limits for the class of hair wanted for their special requirements, and much firmer and stable prices would thereby be in evidence.

The above remarks apply in a general sense to well-bred flocks. Farmers who have a percentage of half or three-quarter bred Angoras in their flocks should bale hair from such low-bred animals separately. This hair from low-bred goats contains a very large percentage of "kemp," and for that reason should never be baled with hair from well-bred animals.

A clip even in length, fineness, lustrous, and of good quality should be the aim of every grower of mohair, and this end can only be attained by systematic and scientific mating, and by going in for annual culling.

THE FARMER'S PART.

There is no doubt that South African mohair is getting too coarse in fibre, and that in consequence growers are finding it extremely difficult to compete with Turkish hair, which is much finer in quality. It is not intended to go into the reasons why this is so, as they are well known to breeders, but to state that the statements frequently made by buyers to that effect are quite correct, and that the trade will not buy the coarse article if it can get the finer. It is now a matter for the farmer to concentrate on the production of a finer hair in so far as the climatic conditions of his farm will allow, and the only way by which this can be done is for him to mate finer haired bucks with his ewes. This question was dealt with on pages 57 and 60 of the pamphlet issued by me on the wool industry.

Exports of Grain, Etc., 1921-1922 Period.

The following were the exports of grain, etc., in bags during the month of May, 1922:—

Maize, 103,736; maize meal, 13,787; maize grit (rice), 2657; hominy chop, 3154; oats, 8158; lucerne seed, 952; total for the month, 132,471 bags.

Exports for the period 1st July, 1921, to 31st May, 1922:—Maize, 3,210,779; maize meal, 1,271,824; maize grit (rice), 7847; hominy chop, 39,167; maize flour, 357; kaffir corn, 13,971; oats, 32,589; beans, 109; lucerne seed, 4392; bran, 2870; manna seed, 10; total, 4,574,915 bags.

Stocks on hand at all ports on 31st May, 1922, were as follows:—Maize, 56,528; maize meal, 10,110; oats, 4338; lucerne seed, 1; hominy chop, 640; maize grit (rice), 11; total 71,628 bags.

* "The Wool Industry," Bulletin No. 4, 1920, obtainable from this office: price 1s, prepaid.

THE ORIGIN OF FEATHERS FROM THE SCALES OF REPTILES.

By PROFESSOR J. E. DUERDEN, M.Sc., Ph.D., F.Z.S.,
Grootfontein School of Agriculture.

SOUTH AFRICA takes a special interest in the plumage of birds. In pre-war days the annual income to the Union from the exportation of ostrich feathers overseas amounted to almost three million pounds sterling, derived from nearly one million domesticated ostriches. During the years of the war and of the economic depression which have followed the value of the plumes exported has been greatly reduced, reaching only about half a million pounds last year (1921). There is every indication, however, that with the restoration of settled economic conditions, the ostrich will be restored once more to the proud position which it formerly occupied among the agricultural efforts of the country.

One of the many problems confronting zoologists is that concerned with the origin of feathers, as a covering of birds, and as a means of flight. No structure at all resembling them is to be found in any other animal to show the course along which they have evolved. Since the days of Huxley, however, very little doubt has remained that in some manner feathers have been derived from the scales of reptiles, the group of animals which includes the living lizards, snakes, crocodiles, and tortoises, and numerous extinct forms.

Professor Huxley proved conclusively that in many ways the scale-covered, cold-blooded reptile is closely related to the plumage-covered, hot-blooded bird, and subsequent investigations have served to support the relationship. From this the view naturally followed that the feathers of birds, however different they may at first sight appear, have in all probability originated from the scales of reptiles.

It was known that scales and feathers are much alike during the early stages of their development, both being formed as upgrowths of the outer layer of the skin or epidermis, followed by the under layer or dermis, which supplies the nutritive blood plasma; and it has been generally assumed that in some manner the scales of reptiles, such as those of the lizard, had become frayed out until they took on the character of feathers. Very little real evidence in support of the theory has, however, been forthcoming, nor of how the fraying-out first took place. One of the latest contributions is that by Professor Cossar Ewart, Edinburgh University, who, in the September number (1921) of the "Proceedings of the Zoological Society," London, contends that while feathers were associated with scales in their origin, they yet arose independently of them from the skin.

Since birds are held to have sprung from reptiles, it follows that the ancestors of birds must have been entirely covered with scales, as are all reptiles at the present day. This scaly covering has largely

disappeared and been replaced by feathers in all modern birds, but relics of the scales frequently persist on the legs and toes of birds. It would therefore be reasonable to expect that these surviving scales might in some instances indicate how the passage from scale to feather has been made. As a matter of fact, we find many birds with feathers as well as scales on their legs and toes, and these should provide the clue. Feathered legs are known in many breeds of poultry, such as Cochins, Brahmas, Langshans, Bantams, Silkies, and Sultans, while they sometimes appear in Leghorns, Minorcas, Wyandottes, and Orpingtons. They also occur on the legs of domesticated pigeons, owls, and many other birds. Although some study

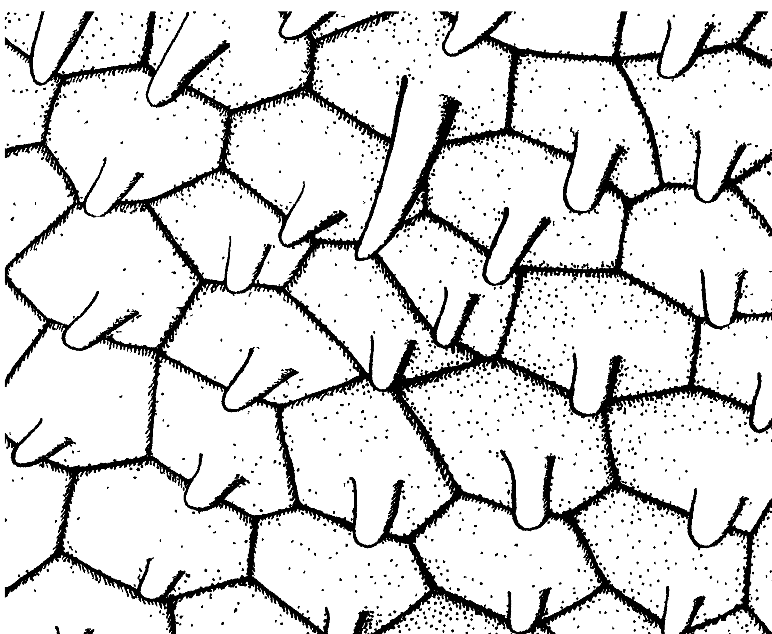


FIG. 1.—Part of skin from foreleg of ostrich chick, about the time of hatching. The skin is here covered with small flat, polygonal scales, and from the lower border of each arises a short upgrowth or papilla, each of which represents an early stage in the development of a feather.

has been given to these cases of feathered legs, the actual relationship of scale and feather has never been established. It will now be shown that certain conditions prevailing in ostrich chicks at about the time of hatching afford the true key to the problem.

The ostrich, as is well known, has a row of large, overlapping scales passing down the front of the tarsus or shank of the leg, and also over the two toes. In addition, the general surface of the tarsus at the sides and behind is covered with very small scales, which are continued for some distance up the leg, and cease where the leg feathers begin. *At the place of transition, where the scales, as it were, are about to pass over into the naked part of the skin, they*

actually begin to give rise to feathers: we have, in fact, feathers growing directly out of the scales.

The scale feathers are to be found on ostrich chicks only about the time of hatching, and for a week or two prior to hatching. After the chick leaves the egg the larger ones open out, and are exactly like the down, which covers the body generally; but the greater number fail to expand, and the feather germ atrophies within a week or two after hatching, when the expanded feathers also fall out. To see them, therefore, the ostrich farmer must examine the upper part of the leg of the chick as soon as hatched or, still better, make observations on any late chicks which happen to die in the shell. It

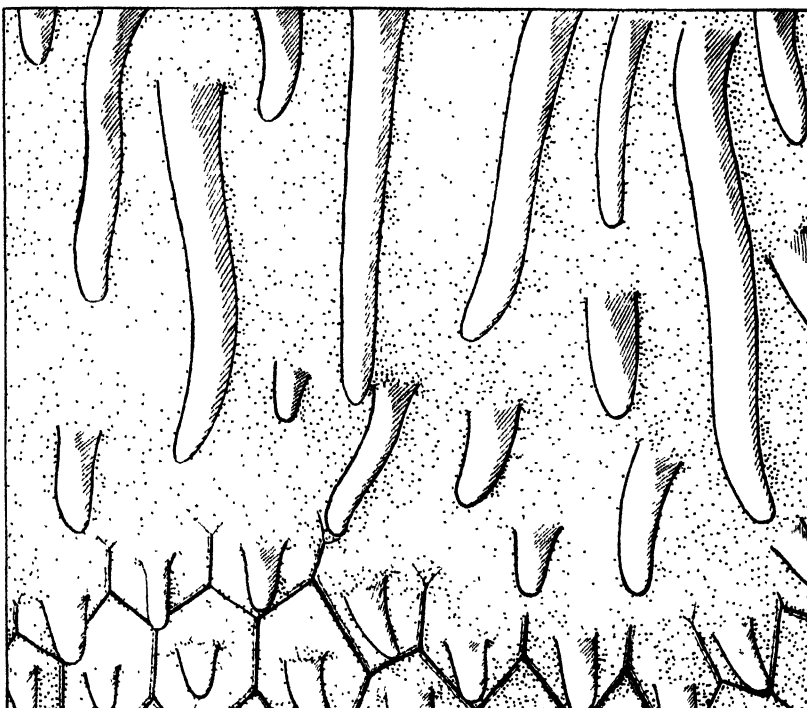


FIG. 2.—Part of skin a little higher up the leg than that shown in fig. 1. The scales, each with a feather papilla, are present in the lower part, but disappear above, where the skin is naked, apart from the presence of feather filaments. These latter are short and irregularly arranged at first, but above they pass into the long filaments which give rise to the down covering the upper part of the leg of the ostrich chick.

will be found that they show much clearer in some chicks than in others.

The appearance under a low power of the microscope of a portion of the skin, just before the scales leave off, is represented in Fig. 1. Each separate area represents one of the small leg scales, which join one another by their edges. From the lower border of each a blunt upgrowth or papilla emerges, which partly overlaps the scale below it. Microscopic sections have been made of these upgrowths, and

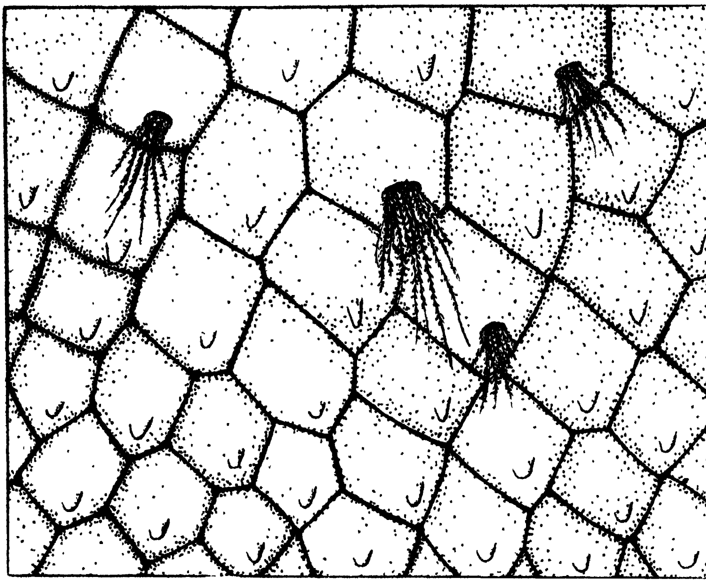


FIG. 3.—Part of skin from ostrich chick, about two weeks after hatching. Four of the larger feather filaments have opened out into small, tuft-like feathers, composed of barbs with barbules, resembling the down which covers the young chick. The feather papillae on the other scales are much smaller than those on the chick before hatching, and soon completely atrophy: the scale-feathers also fall away.

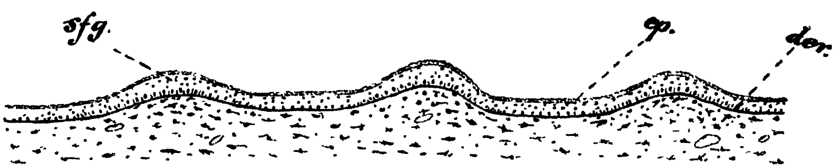


FIG. 4.—Section of skin of ostrich chick, after about 20 days' incubation. As in all birds and other animals, the skin consists of an outer layer or epidermis (*ep.*) and a lower layer or dermis (*der.*). The former has a very thin layer on its outer surface called the epitrichium or periderm. The feather is formed entirely from the epidermis, but is nourished in its growth from the dermis, which alone contains bloodvessels. At the stage represented the scales and feathers show as slight thickenings of the skin, the scale-feather germs (*sfg.*) rising a little above the general surface.

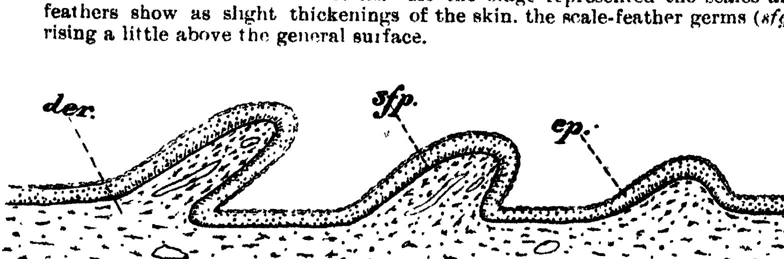


FIG. 5.—Section of skin of ostrich chick, after about 25 days' incubation. The scale-feather germs have now grown up into feather papillae (*sfp.*), but the boundaries of the scales are not yet formed.

their internal structure proves that they are true feathers in an early stage of development. The conditions a little higher up the leg, where the scales actually disappear, are shown in Fig. 2. Here the scales occur only in the lower part, while above are seen unexpanded feather filaments of different sizes and irregularly arranged. These arise from the naked part of the skin, and exactly similar filaments may also come from the scales. Fig. 3 represents the appearance in an ostrich chick about a fortnight after hatching. Four of the larger feather filaments have now opened out, and form small tufts of barbs with barbules along each side, exactly like the down feathers which cover the body of the chick, only they are smaller in size. The smaller feather upgrowths on the other scales have not expanded, and have already begun to atrophy, and soon disappear, while the tufts drop out or break away. No trace of the scale feathers therefore are to be found in chicks after they are about a month old. They appear during the early stages of development, but begin to disappear after the chick hatches.

The earliest appearance of the scales and feathers is found on ostrich chicks of about twenty days' incubation. Small white spots are seen on the surface of the skin, and later an upgrowth takes place

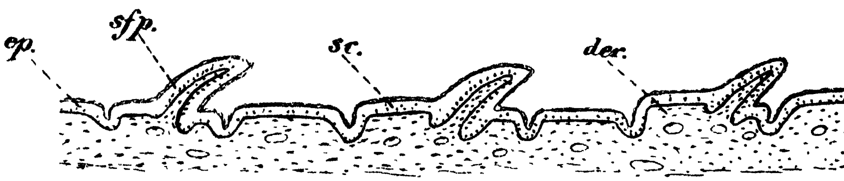


FIG. 6. Section of skin of ostrich chick, in about the same condition as that shown in surface view in fig. 1. The section passes through a number of scales (*sc.*), now distinct from one another, and in three of them a feather papilla is included. The feather at this early stage is seen to be a definite upgrowth from the hind part of a scale, and can be compared with the overlap in scales which imbricate.

from each, and the limits of each scale become defined. Fig. 4 represents a microscopic section through three of these earliest feather-scale germs, while Fig. 5 gives a somewhat later stage where the upgrowths have begun to form. Fig. 6 represents a section through several scales, at about the same stage as those shown in surface view in Fig. 1, from three of which very definite feather upgrowths arise; while Fig. 7 shows an older feather filament, which has already begun to grow downwards into the skin to form the feather socket. All these stages leave no doubt whatever that a scale and a feather are one and the same formation. They both originate from the same germ. From its hind surface the scale sends out a small upgrowth which elongates into a filament, and within the filament changes go on which ultimately produce a feather. *In its origin, therefore, a feather is nothing more than the modified overlap of a scale.*

The internal changes in the filament, which ultimately result in the formation of the feather, are very complex, but the details are beyond the scope of the present paper. Some conception of the process can, however, be gained from a study of Fig. 8. This represents a transverse section through a developing feather filament,

some time before it is ready to open out. From the description given it will be gathered that the innermost layer of the outer skin or epidermis is split up into separate ridges (barb ridges) by invasions from the middle pulp or pith of the growing feather, but that the outermost layer of the epidermis remains unsplit. The cells of each ridge then become altered in such a manner that they give rise to the horny barbs and barbules of the down feather, while the unsplit outer layer becomes the feather sheath. When the chick hatches and the filaments dry, the feather sheath cracks and falls off, and the barbs separate from one another, and expand into the tuft-like feathers which cover the young chick. The formation of the second feather (spadona), and of those coming later, is necessarily more complicated, owing to the presence of a central shaft or rhachis from which the barbs appear as if split off, just as the barbules appear split off the barbs.

It can now be proved that the feathers on the legs and toes of such birds as pigeons and poultry arise from scales in the same manner as those in the ostrich. Fig. 9 represents a part of the outer surface of the feathered leg of a pigeon. The large scales to

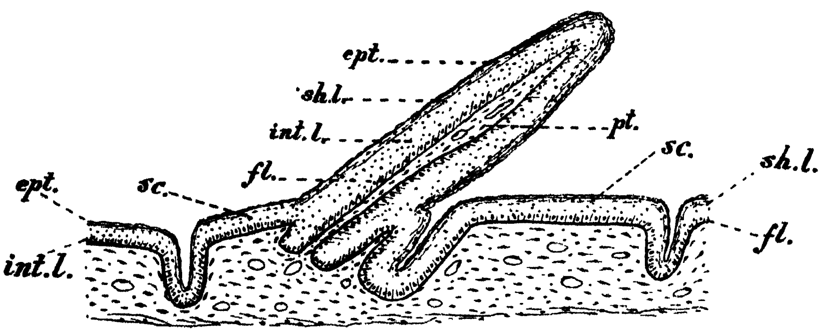


FIG. 7.—Section through a feather filament, again showing the feather to be an outgrowth from a scale. The epidermis of the scale is made up of several layers of cells. The lowermost is the formative layer or Malpighian layer (*fl.*), its cells are active, and continually dividing and adding others to the layers above. The second is the intermediate cell layer (*int. l.*), while the third is the sheath or horny layer (*sh. l.*) in which the cells are being formed into horny material. As before, the epitrichium (*ept.*) forms the outermost layer of the epidermis. The same layers are continued from the scale into the feather, and these become changed into the various parts of the feather, such as barbs, barbules, and feather-sheath, which are better shown in the next figure. The middle pith or pulp of the feather (*pt.*), which nourishes the feather during its growth, is really a continuation of the under-layer of the skin, the dermis (*der.*). The lower part of the feather grows downwards into the dermis, forming a follicle or socket, and thus gives the appearance of the feather growing through the scale, as in figs. 3, 9, and 10.

the left are down the front of the shank, while the smaller scales cover the side of the leg. From the lower part of each of the small scales emerges either a single feather or a tuft of barbs, all of which have been cut short in order to show more clearly their connection with the scale. The feather appears as if growing out of an aperture in the scale, and in some cases it has fallen out, leaving only the circular opening. In the upper part the scales have disappeared, and only the feathers remain.

Fig. 10 represents the appearance of a part of a feathered leg of a fowl, the large scales to the left again corresponding with those down the front of the tarsus. Here the scales have almost entirely disappeared down the middle of the leg, being replaced by feathers, but towards each side feathers are seen emerging from the scales. In some cases they come through an aperture in the actual surface, as in the pigeon and ostrich, and in others they appear as if coming from under the scale. The leg feathers in both the pigeon and the fowl persist throughout the life-time of the bird, and are moulted in the same manner as are the feathers covering the wings and body, whereas in the ostrich they continue for only two or three weeks after the chick has hatched. When, however, the relationship of the feather with the scale in the pigeon and fowl is compared with that

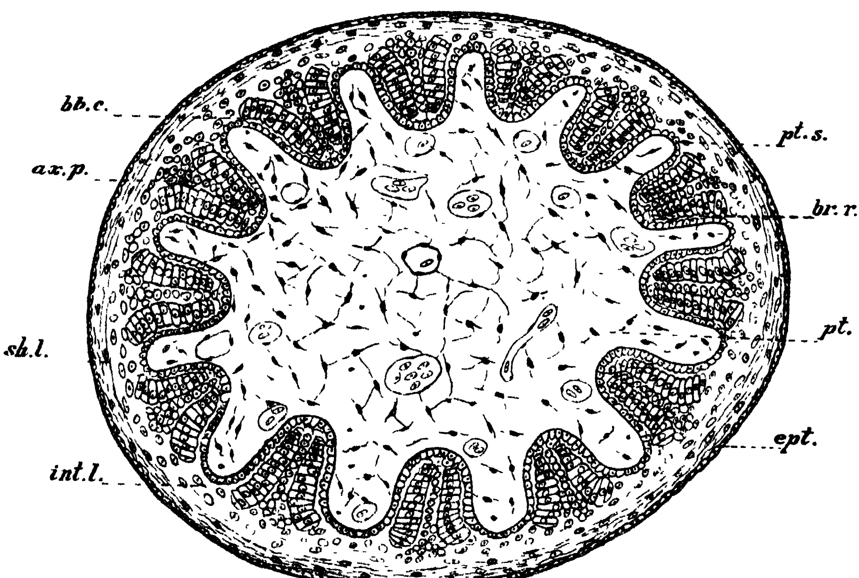


FIG. 8.—Transverse section through a growing feather filament, a short distance above its emergence from the scale The inner part of the epidermis is shown to be divided into thirteen barb-ridges (*br. r.*) by the invasion of the central pulp or pith (*pt.*); four of the ridges extend the whole length of the filament, but the others only about half-way. The ridges form the barbs and barbules of the down feather of the ostrich chick; the cells of the axial plate (*ax. p.*) forming the barb, and the barbule-forming cells (*bb. c.*) on each side give rise to the barbules. Outside the barb-ridges is the undivided feather-sheeth layer (*sh. l.*) which later becomes thin and horny. This flakes off when the chick hatches and the feathers dry, thereby liberating the barbs, which then separate and form the tuft-like feathers of the chick.

in the ostrich chick, there can be no question that the feather is formed in a similar manner in all three, that is, as an overlapping outgrowth from the scale. In modern birds the covering of feathers has almost wholly replaced the ancestral covering of scales, and Figs. 9 and 10 show how the replacement takes place. The scales gradually disappear before the encroachment of the feathers, probably owing to the fact that the latter withdraw the nourishing blood from them.

The conditions prevailing in ostrich chicks strongly suggest that the earliest birds in geological times were completely covered with small, simple, tuft-like, downy feathers, all of the same size and very densely crowded, each growing out of a small scale. The general surface appearance of the whole body, and also of the wings and tail, was probably much like that of the neck of the ostrich at the present time which, as every farmer knows, is covered with small, tuft-like feathers, all alike and closely crowded. It is manifest that feathers

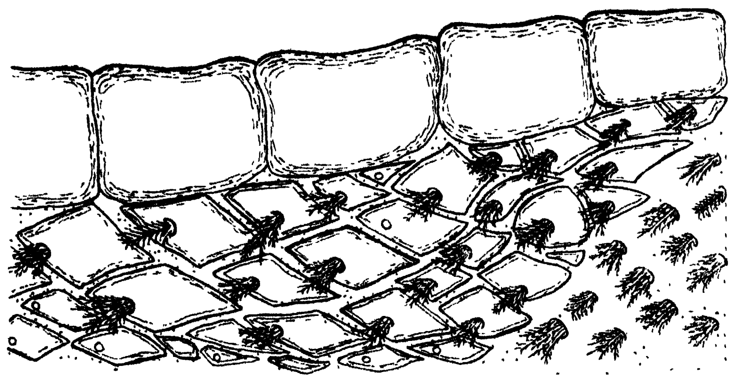


FIG. 9.—Part of the tarsus of a pigeon with feathered legs, showing the feathers growing out of the small scales which cover the side of the leg. The feathers have been cut short in order to show more clearly their connection with the scales. The scales have disappeared above, and only the feathers remain

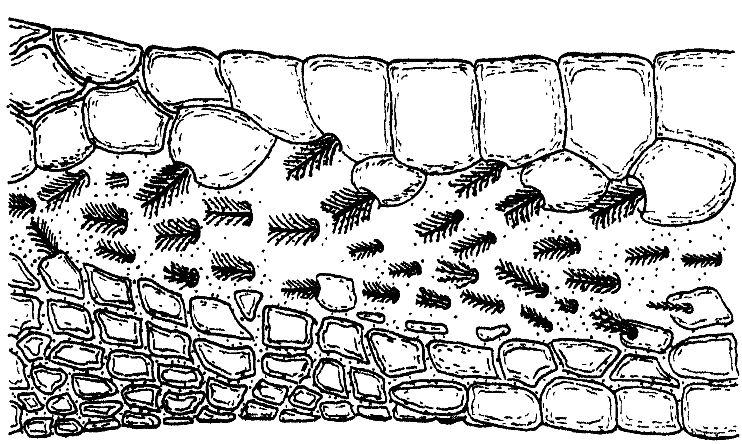


FIG. 10.—Part of the tarsus of a common fowl with feathered-legs. A number of feathers are seen to be growing out of scales, as in the pigeon and ostrich chick, while down the middle the scales have disappeared, and only the feathers remain.

of this kind would be altogether useless for purposes of flight; and it is most likely that at first feathers had nothing whatever to do with flying any more than they have in the ostrich at the present time. Later, in the course of evolution, certain of the small scale feathers assumed a dominance over the others, and grew larger and

more complex in structure, and ultimately a compact web or vane was formed when flight became possible. The under covering of small down feathers found in most birds, but only around the large wing and tail feathers of the ostrich, represents the persistent primitive covering of birds, though the feathers have become structurally more complex, and the scales have disappeared. The outer covering of large contour feathers, specially developed as remiges on the wings and as rectrices on the tail, is a secondary acquirement of birds, but it has not displaced the first covering, though almost so in the ostrich.

In the course of its development therefore the ancient ostrich presents us with evidence showing how the horny scales derived from reptiles have become transformed into the glorious plumes of birds by a complex process of fraying-out of scale upgrowths; and another stage in the evolution of birds from reptiles is thus solved. It is manifest that ostrich plumes, of such great commercial importance to South Africa, and employed for decorative purposes the world over, are really nothing more than the highly specialized frayings of scales.

[I am under obligation to Mr. F. C. Smith, Lecturer in Ostriches, for most of the material required for the investigation, and Mr. J. Walker has assisted me with some of the drawings.]

Citrus Export: Advice on many Points.

Under the above caption in last month's issue of the *Journal*, reference was made to the literature issued by the Department for the guidance of citrus growers. A quotation was made from one of our bulletins that "the markets of Europe and North America are open to the South African fruitgrower." It must be remembered, however, that so far as the United States are concerned there exists to-day an embargo on the importation of South African citrus fruits owing to the presence of citrus canker in the Union. As is well known, however, the Department has this disease well in hand: it is confined to limited areas in the Pretoria and Rustenburg Districts, the danger of recurrence is small, and it is hoped soon entirely to eradicate it.

Honey Production: Bright Prospects.

In a letter to the Trade Commissioner, London, the Secretary of the Apis Club, Port Hill House, Benson, Oxon, England, writes:

"In view of our international activities we shall be publishing notes encouraging the development of the bee-keeping industry in the Union. We learn from several of our members that the conditions are so favourable for developing bee-keeping on commercial lines that there is every prospect of making South Africa, from a honey production point of view, a second California. If in any way we could be of service to South African bee-keepers we would be glad to hear from you."

It is interesting to hear from outside sources of the favourable light in which the Union's honey-producing possibilities are viewed. Nor is the prospect too optimistic, for, aided by the South African Association of Bee-keepers (P.O. Box 6057, Johannesburg), there is every reason to expect rapid development in the industry in this country.

BASIC SLAG.

The Change in its Composition.

Report by CHAS. F. JURITZ, M.A., D.Sc., F.I.C.,
Chief, Division of Chemistry.

A CONSIDERABLE change has come over the composition of basic slag since the war, whereby its grade has been lowered. The subject has been given serious attention in England, and the Imperial Minister of Agriculture in July, 1920, appointed a committee to study the basic slag problem, with Dr. E. J. Russell, the Director of the Rothamsted Experimental Station, as chairman. Towards the close of 1921 this committee submitted an interim report, which has not yet been published.

The change of composition is due to the fact that in the steel industry the basic Bessemer process, of which basic slag was a by-product, has now been superseded by the basic open-hearth process, and the character of the by-product has been entirely altered, its phosphate content having been halved.

INVESTIGATIONS IN ENGLAND.

The terms of reference placed before the Departmental Committee, which comprised steelmakers, fertilizer manufacturers, and farmers, were "to consider the development and improvement of the manufacture of basic slag and the extension of its use." The committee has up to the present discussed such questions as these: (1) the quantity of slag producable under present conditions; (2) how much slag can be advantageously utilized by farmers in Britain; (3) how the quantity or quality of the slag may be increased by combining with the ordinary manufacture of steel some subsidiary process; (4) what the agricultural value of the present quality of slag is.

(1) Before the war the annual output of high-grade slag in Britain was 260,000 tons. In 1920 it was only 46,000 tons. It may be of interest to tabulate the whole of the 1920 output according to grade:—

Over 15 per cent. phosphoric oxide	46,000 tons.
12 per cent. and under 15 per cent.	121,000 tons.
10 per cent. and under 12 per cent.	91,000 tons.
7 per cent. and under 10 per cent.	302,000 tons.
5 per cent. and under 7 per cent.	118,000 tons.
Under 5 per cent.	23,000 tons.
Total	701,000 tons.

In addition to the 46,000 tons of high-grade slag—and it will be remembered that, according to our own definition, high-grade slag must contain not 15 but 16 per cent. of citric-soluble phosphoric oxide, and in the above table not only the citric-soluble but *all* the phosphoric oxide is included—there was only 212,000 tons of lower-grade slag that would have been allowed on our market at all even under our relaxed war-time regulation No. 11. This quantity would not even suffice the British farmer, and precludes all idea of export. As for the 23,000 tons below 5 per cent., it would not be worth grinding.

(2) As far as the second point discussed by the committee went, it was estimated that the farmers of the United Kingdom ought to have been using 890,000 tons of basic slag annually, even before the war.

(3) Regarding the augmentation of the phosphate in the slag from subsidiary sources (*a*) some experiments were carried on by adding rock phosphates in the proportion of ½ cwt. per ton of the slag in the fused state, but there was not sufficient alteration of the rock phosphate to justify the process, and the committee decided that such an addition could only be justified if it improved the character of the rock phosphate added. (*b*) The use of iron ore containing more phosphorus or the addition of phosphates in the blast furnace was considered, but from the steel manufacturer's point of view this would add to the cost of production of the steel, and could, therefore, be adopted only if the price of the resulting slag were sufficiently attractive. The matter is still under consideration. (*c*) Another point remaining under consideration is the reintroduction of the two lowest grades of slag into the blast furnace so as to increase the phosphatic character of the pig-iron, and thus produce a higher-grade slag.

(4) The committee arranged for experiments to be carried out at Rothamsted to elucidate—

- (*a*) Whether the soluble and insoluble open-hearth slags differ in agricultural value, and, if so, whether some method of evaluation can be devised better than the present citric acid method;
- (*b*) whether the present open-hearth slags are inferior to the pre-war Bessemer slags when applied in quantities of equal phosphatic content;
- (*c*) whether finely ground mineral phosphates differ greatly in value from basic slag;
- (*d*) whether the manurial effect of basic slag is wholly dependent on its phosphate content, or whether other constituents (manganese, etc.) should be considered of value.

Up to six months ago no conclusion had been arrived at on the first three of these points, and on the fourth the results lent no support to the idea that manganese is of value.

THE QUESTION OF SOLUBILITY.

In the January, 1922, issue of the *Journal of the Ministry of Agriculture* " Dr. E. J. Russell says that " in days before the war

farmers were always urged to purchase only high soluble slag, and the grades sold by the best firms had a solubility of 80 per cent. and upwards. During the war the process of manufacture changed, and it is an open secret that the experts are no longer so much in agreement as they were in regard to the desirabiltiy of a high soluble slag. Experiments have been initiated to obtain more definite information, and until these are completed it is not possible to lay down precise rules for the farmers' guidance. In the meantime it is wise to assume that a high soluble slag will usually come into action more quickly than one of low solubility, and that a larger return may therefore be expected in the first season. It is possible, however, that in later seasons the low soluble slag may grow in effectiveness, and at the expiration of five years there may be little difference between the two; in some experiments, e.g. in Essex, this is clearly demonstrated. Until more definite evidence is forthcoming perhaps the safest assumption the farmer can make is that high-soluble slag may pay him interest on his outlay almost from the beginning, while the returns from low-soluble slag may be deferred."

By high-solubility and low-solubility in this quotation, it may be explained, is meant the proportion of citric-soluble to total phosphoric oxide in a slag, and not necessarily the high or low proportion of soluble phosphoric oxide to the slag as a whole.

In the Essex experiments comparative tests were made of the following two fertilizers:—

Class of Fertilizer.	Proportion of Citric-Soluble in Total Phosphoric Oxide.
Open-hearth basic slag	20 per cent.
High-grade basic slag	91 per cent.

The produce of two types of soil sown with clover resulted as follows:—

	Soil No. 1.		Soil No. 2.	
	Open-hearth Slag.	High-grade Slag	Open-hearth Slag.	High-grade Slag.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Clover	27	50	44	46
Grass	45	33	32	47
Weeds	16	14	13	1
Bare	12	3	11	5

Dr. Russell's comment on this was that "the crop returns show that high-grade slag is, as a matter of fact, rather better than low-grade, especially in improving the quality of the herbage. The difference is not so great as would be expected from the difference in solubility, and it seems clear that present-day analytical methods do not deal satisfactorily with present-day slags."

Such then is the position to-day. We have not yet come to the stage of finality in the matter. It is true that general buying conditions on the basis of 16.1 per cent. citric-soluble phosphoric oxide cannot now be reached, but then we do not ask for such a basis, even in our existing unrelaxed regulations—"12 per cent. of phosphoric oxide soluble in citric acid" is the minimum limit laid down by Regulation No. 11. On the other hand, it must be borne in mind

that not only has the total percentage of phosphoric oxide in slag diminished, but even of that reduced total a much smaller proportion than before is soluble in citric acid.

Although, therefore, I think that the regulations need amendment*, it will never do to relax them to an extent that will permit of the unrestricted sale in this country of material which may later on be shown to possess but the scantiest agricultural value.

THE TEMPTATION OF ADMIXING.

There is another consequence of the altered quality of basic slags to which I wish to draw attention. The temptation to admix other phosphates has obviously become greater than it used to be, and quite recently the term "slag phosphate" has been applied in England to a mixture of basic slag and mineral phosphate which has appeared on the British market. Dr. Russell has issued a warning to farmers to be careful to realize exactly what these words stand for when they are used.

Mixtures such as these have not yet, as far as I know, made their appearance in South Africa, but doubtless they will not be long in coming, and in the meanwhile I may also draw attention to a note published in the *New Zealand Journal of Agriculture* about three months ago by the New Zealand Agricultural Chemist to the effect that phosphate rock from Nauro and Ocean Islands has been sold to a Welsh basic slag company for the purpose of grading up their slag, and that the British Ministry of Agriculture has recommended farmers to try this mixture of slag and phosphate rock on their grass lands, and to lay thereby a good foundation for arable land. Regarding this mixture, too, experiments are in progress, both in Great Britain and in New Zealand, and for the present it only lies with us to differentiate between it and true basic slag.

Outbreaks of Animal Diseases: May, 1922.

Disease.	Transvaal.	Natal	Cape	Orange Free State.	Transkei.	Totals for May, 1922.	Total, Calendar Year 1921.
East Coast Fever	2	19		-	4	25	212
Mange	1	—	—	—	-	1	272
Anthrax	44	3	8	33	27	115	1557
Dourine	1	—	4	2	—	7	50
Glanders	1	—		—	—	1	8
Tuberculosis	—	-	1	-	—	1	10
Epizootic Lymphangitis	—	-	2			2	6

* The Regulations were amended by Government Notice No. 963 of the 14th June, 1922, which provides that the minimum content in basic slag of phosphoric oxide soluble in citric acid shall be 10 per cent. instead of 12 per cent.

PIG FARMING.

II.

Our More Important Breeds of Pigs.

By W. A. K. MORKEL, M.Sc., Lecturer in Animal Husbandry, and Vice-Principal, Elsenburg School of Agriculture.

THE LARGE BLACK.

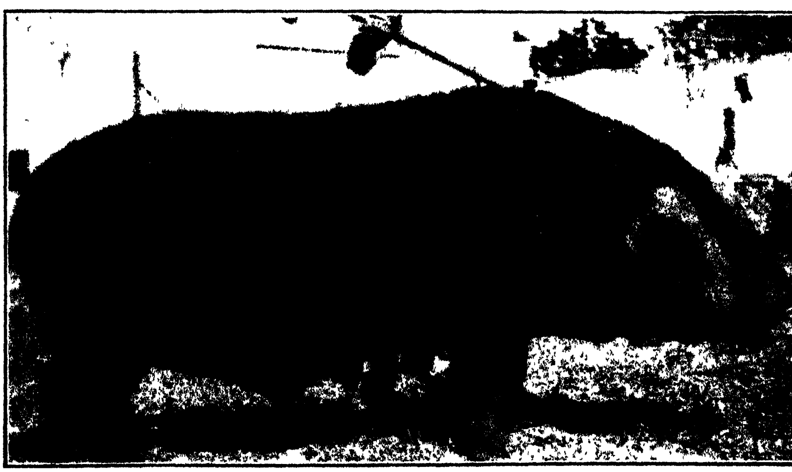
(*a*) *Origin.*—The origin of the Large Black breed, like that of so many of our domesticated breeds of live stock, is to a large extent veiled in obscurity. There is no doubt that the breed in common with nearly all of our present-day pure-bred breeds of swine is descended from the "Old English Hog" (*Sus scrofa* type) of the sixteenth century. John Mills makes mention of the "Chinese pig" (*Sus indica* type—*vide* article No. 1) in England, in 1776, the introduction being credited by some authorities to Robert Blakewell, of Dishley. This breed was for the most part solid black in colour, very prolific, early maturing, and the fact that they first landed in Essex—one of the counties of origin of the breed—would justify the belief that these Chinese pigs played an important part in the building-up of the Large Black breed.

In later years Lord Western introduced from Naples the well-known black "Neapolitan Breed," which may be traced back to the early Roman type of swine. He was the biggest breeder of pigs in Essex, and as a result of the crossing of the Essex with the Neapolitan type, he evolved "Western's Neapolitan Essex," which was later responsible for the "Essex Half-backs," and finally the present-day "Wessex Saddle-backs," from which the Large Black breed was built-up as the result of selection. Selection for solid black colour was in all probability due—as reported by Young in 1807—to the fact that the white band of saddle-backed pigs was particularly subject to sunscald when these pigs were grazed on clover.

The Large Black, although only officially recognized since 1899, when the Breed Society was formed in England, is nevertheless one of the oldest of our present-day breeds of pigs. Large Blacks have for many years been bred in the western and eastern counties of Great Britain, i.e. Devon and Cornwall, and Suffolk and Essex respectively. In the early days they were noted for their great size, prolificacy, and grazing ability. It was not an unusual thing to hear of Large Blacks tipping the scale at 800 lb., which weight they were very often allowed to attain before being slaughtered. As might well be supposed, they were distinctly coarse, having plenty of heavy bone, rather prominent shoulders, a pendulous jowl, a coarse coat of hair, more often than not decidedly curly, and as a rule they were rather wasty along the underline. Their great length was in keeping with their rather long faces. They have been described as being cabbage-like in ears, over which they had invariably little, if any, command. The tail was inclined to be very low-set, coarse, long, and ending in a heavy switch.

During the twenty-three years that its Society has been in existence, the Large Black breed has undoubtedly made remarkable progress both in so far as improvement in type and increase in numbers are concerned. According to the Census figures issued by the Minister of Agriculture, there were no less than 10,854 pure-bred registered Large Black pigs in the United Kingdom in 1919, or in other words approximately twice as many registered pigs as that of any other pure breed of swine. In the Union we have also experienced increases of a somewhat similar nature. During 1916 for example, only about 200 pure-bred Large Blacks were registered in the S.A. Stud Book, whereas during the 8½ months—1st July, 1921, to 15th Aprill, 1922—this number has soared to 705.

Improvement in type has also been brought about in many important respects, without in any way sacrificing prolificacy and grazing ability, for which characteristics the breed has long been held in high repute. During the past decade particular attention has been paid to early maturity and quality, in both of which respects the breed has improved out of all recognition.



"Sudbourne Arab" (imported), at the age of eight years. This sire was for many years the herd boar at Elsenburg, whose Large Blacks are to-day linebred to him.

(*b*) *Breed Characteristics.*—The head should be medium in length, and the snout ordinarily straight. Certain strains have been developed for a moderate dish in the forehead, which is highly desirable, as it allows the ears to fold over well, and carry down to the tip of the snout. Where the entire face is particularly straight one frequently finds that the ears have a tendency to hang wide and short in comparison with the length of the snout. The dishing should be the result of a distinct drop from the poll to between the eyes, from which point the snout should extend straight. Anything in the nature of a snub-nose is highly undesirable, for the reason that it cannot fail to make one suspicious of the presence of Berkshire or other foreign blood. The ears should be long, thin, soft, and shapely, with good width between them at the poll; short, pricked, or cabbage-like ears are to be descriminated against. The jowl should be of

medium size, and the neck muscular and of good length. A pendulous jowl is equally as objectionable as a short stocky neck. The chest should be deep, and of medium width, and the shoulders obliquely placed, blending well with the chine and fore-ribs, to form a neat smooth shoulder-top. Excessive width of chest is correlated with wide heavy shoulders, giving an open shoulder-top, none of which is desirable. The crops should be full, the ribs well sprung—not excessively wide—and well let down to give the required heart-girth, indicating constitutional vigour. The back should be of good length, medium width, and as a rule slightly arched at the loin and fore part of the rump. Openness in the crops is associated mostly with coarse shoulders, while levelness of top-line is not so desirable as a slightly arched back, as may frequently be noted in matured sows that have produced a number of litters.

The sides should be long and mediumly deep, being well let down in both fore and rear flank, and the ribs well sprung. Good depth and spring of rib are very desirable, though they should not be obtained at the expense of good length—one of the outstanding characteristics of the Large Black breed. The loin should be of medium width, strongly muscled, and appreciably arched. The rump should be equally well muscled, of medium width, and rounding out well, not sharply dubbed off. The hams should be firm, plump, and let down well into the hocks. The twist should be deep and devoid of prominent fat pockets, especially in the case of gelts and sows, as these are often found in poor milkers, and equally poor breeders. The tail should be large, prominently set, and moderately high placed, in order to allow of as large a development of ham as possible. Many breeders consider a large prominent tail as indicative of constitutional vigour. In the great majority of cases this is true, but it should also be remembered that a large and prominent tail is invariably correlated with coarseness. The legs should be well set under the body, strong, and show plenty of bone. Bow-legs, knock-knees, crooked or deformed legs, also excessively fine or heavy bone, are all undesirable features. The pasterns should be medium in length, and strong to ensure the animal standing well upon his feet, and the two cloves of each foot should be closely knit. Long heavy pasterns and open spreading cloves are objectionable, since they reduce the height of the animal, impair his grazing ability, and detract from his style and character in general.

Wrinkles, if pronounced, are undesirable, especially in young boars and gelts, as they are undoubtedly indications of coarseness. However in the case of matured boars and sows, particularly in the former, one should not necessarily descriminate against a reasonable amount of wrinkling, as this condition is to be expected with age.

The underline should be comparatively trim, as any decided tendency to flabbiness is a sign of coarseness, and is most undesirable from a slaughter point of view. In the case of sows there should be at least half a dozen pairs of well-developed teats. It not infrequently happens that seven pairs of teats are found, particularly in sows that come from prolific families, and is therefore a most desirable feature. The number of teats as well as their fullness in development, are undoubtedly indications that sows having these characteristics are not only likely to farrow large litters, but also regular breeders.

Sows or gelts having less than six pairs of teats, and particularly if these are poorly developed—sometimes called buttons—are to be

strongly descriminated against as breeders. In the case of both gelts and sows, they should always be distinctly feminine. Any tendency to masculinity is undesirable, as females of this type are more often than not lacking in either prolificacy or fecundity, or both.

In the case of boars it is equally important to have them decidedly masculine, as practical experience has shown that boars of this type are far more prepotent than those showing effeminacy. Boars should, in addition to other necessary qualifications such as good size for age, trueness to breed type, constitution, etc., be rugged, and show a well-developed pair of testicles. If anything, it is wiser to err on the side of ruggedness than that of over refinement. This does not mean that they should not show quality. Quality should be sought for in both male and female breeding stock, but to a greater extent in gelts and sows, for the reason that females of this type are as a rule not only more fecund, but are also better mothers. They invariably have more milk, and are not as clumsy in rearing their

"Honingsberg Maiden," a typical Large Black matron. In seven years she produced 11 litters, or a total of 165 pigs.

litters as the big rugged sow, particularly if her ruggedness is sufficient to consider her as being decidedly coarse.

A medium coat of soft, straight hair is most desirable. Some strains of Large Blacks may be found to be comparatively hairless, whilst yet in other strains we find that the coat of hair is either distinctly curly or ginger-tinted, in all of which cases they should be descriminated against. A curly-coated condition is usually correlated with coarseness, whilst the ginger-tinted condition is particularly objectionable, because in breeding from individuals having this characteristic, there is no doubt that one is likely to increase the patches of ginger hair, and so get away from the true Large Black type in respect of colour.

Yet another undesirable feature in so far as the coat and hair is concerned, is that commonly known as a "Rose," "Swirl," or "Cow-lick," the objection being largely due to the fact that it detracts from the general appearance of the animal, and practical experience has shown that it is apparently hereditary. In certain strains one finds

a kind of jet-black skin, which is not liked by bacon curers, because of the fact that the black pigment is likely to appear in the belly bacon, and so reduce the value of a bacon side considerably. On the other hand, a distinct lack of pigment is perhaps even more undesirable, especially under South African conditions, as it is the intensity of pigment that affords protection from sunscald and sunburn. It is my experience that imported Large Blacks are invariably heavier coated, and have more intense pigmentation, than Large Blacks bred in the Union; moreover, that the imported stock in the course of time becomes noticeably thinner coated, whilst the pigmentation also becomes less intense. These are changes no doubt caused by our climatic conditions.

In size the Large Black may be considered to be among the biggest of the breed. "Sudbourne Arab," an imported boar, used in the Elsenburg herd for no less than seven years, scaled 730 lb. at maturity. Mature sows will ordinarily weigh, depending upon their condition, from 400-550 lb. Boar pigs and gelts at 8½ months of age, have averaged just over 200 lb. in live weight. In the case of weaners, which are ordinarily taken from their mother at 8 weeks of age, the average weight per pig of a number of litters during the past five years, has been approximately 30 lb.

The comparative early maturing character of the Large Black is evident from the fact that with average good care and management it is possible to have them ready for the bacon factory, i.e. about 180 lb. in live weight at just on 8 months. Naturally there is considerable difference in the early maturing of different strains. Individuals belonging to those strains that are comparatively short in body and consequently very deep, are more early maturing than those from strains, whose outstanding characteristic is great length of body with correspondingly less depth.

As baconers, the *pure-bred Large Black* has not as yet found much favour in South Africa, though in England where they have won some of the highest honours in recent years, pure-bred Large Blacks have been very favourably commented upon in respect of their bacon qualities. It would appear that it is primarily a matter of selection to produce the type of pure-bred Large Black that will meet the requirements of the bacon factories. It is common knowledge that quite a number of noted breeders of pure-bred Large Blacks claim that they are dual purpose pigs, and not strictly baconers. My own experience is that both statements can be made to be true, as both conditions can be satisfied to an appreciable extent by selection and breeding for the type required.

For cross-breeding purposes the Large Black breed has undoubtedly proved itself eminently suited to conditions in most parts of the Union. In the great majority of cases cross-breeding has been practised by the use of a pure-bred Berkshire boar on Large Black sows, mostly of pure breeding. This undoubtedly has proved to be, and is still to-day, the most popular cross throughout the country to meet the requirements of our bacon factories, which for the most part are well satisfied with the class of baconer so produced. To a lesser extent Middle White boars, and also Tamworth boars have been put to Large Black sows in the production of baconers. Where the Middle White boar is used a good proportion of the off-spring is ordinarily white in colour, and, therefore, objectionable on account of the liability to sun-scald.

The use of the Large Black boar on Kolbroek sows, which are ordinarily of a spotty colour similar to the Gloucester Old Spots, has proved fairly successful. The progeny are usually solid black in colour, and have developed into quite fair baconers. Large Black boars have also been crossed with Tamworth and Berkshire sows. In the former cross all the progeny are black, as has been proved at this Institution, and although they develop into first-class baconers, they usually take an appreciably longer time—a matter of 2-3 weeks—to reach marketable age, than the Berkshire (boar)-Large Black (sow) cross. In the case of the Large Black (boar)-Berkshire (sow) cross, this practice has not proved as profitable as the reciprocal, for the reason that the Berkshire sow on the average is not as prolific nor as successful a mother as the Large Black sow.

Experiments at Elsenburg.—During the past 3½ years experiments have been carried on at this Institution, which have proved

A vigorous young boar of good length, but a trifle leggy and somewhat too short of ear

conclusively the profitableness to the producer of the Berkshire (boar)-Large Black (sow) cross, as well as their suitability in meeting the requirements of the bacon factory. The progeny of this cross at 8½ months have scaled over 200 lb. in live weight. The reports from the bacon factories on this cross have been of a most encouraging nature. They consider that the sides have good length, that the bellies are nice and thick, and that the meat is comparatively streaky.

In the experimental work above referred to, these Berkshire Large Black cross-breds averaged 79.9 per cent. of dressed weight to carcass, which may be looked upon as quite creditable, especially when it is remembered that they were subject to merely good average treatment in respect of feeding and housing. It was a noticeable fact that these cross-breds were particularly good feeders, despite the fact that in most cases the litters were large in number.

In conclusion, reference must be made to the wonderful docility of Large Blacks, a characteristic which is no doubt due to some extent

to the large ears they carry. Among other noted features of the breed mention must also be made of their prolificacy, size, hardiness, rapid growth, and foraging ability. Large Black sows will not infrequently average 13 or 14 pigs to the litter during 4 or 5 farrows, whilst litters of 19 and 20 have been recorded on many occasions.

Although a very big litter is perhaps not the most desirable, yet litters of a dozen or so at least give the breeder an opportunity of culling out the runts and reducing the proportion of boar pigs for the sow to raise. In this way a breeder has the opportunity of having a proportionately large number of gelts, which are on the average of greater value than his boar pigs. No matter how good the sow may be, she cannot be expected to rear to weaning age more than ten pigs. The Large Black sow is particularly noted for her excellent motherly qualities, which may be accounted for by the fact that she is usually in command of a plentiful supply of milk, and is most docile at all times, even in the hands of comparative strangers.

Among the more important strains or family lines of breeding, mention may be made of:—

Arran.	Docking.	Lynchmere.	Treversquite.
Bassingbourn.	Drayton.	Sudbourne,	Trelucky.
Brent,	Greystones.	Streetley.	Treveglos.
Burwell.	Henham.	Swardeston.	Valley.
Bywell.	Hasketon,	Tiptree.	Vahan.
Bixley.	Iford.	Tartar.	Wiveton.
Cleave,	Lustleigh,	Testerton.	Wilbraham.

LARGE BLACK PEDIGREE PIGS—REVISED SCALE OF POINTS.

Head.—Medium length and wide between the ears	5
Ears.—Long, thin, inclined well over face, nose medium length	4
Jowl.—Medium size	3
Neck.—Fairly long, muscular	3
Chest.—Wide, deep	3
Shoulders.—Well developed in line with ribs	8
Back.—Long and level	15
Ribs.—Well sprung	5
Loin.—Broad	5
Sides.—Very deep	8
Belly and Flank.—Thick, well-developed	7
Quarters.—Long, wide, not drooping	8
Hams.—Large, well-filled hocks	10
Tail.—Set high, moderate size	3
Legs.—Short, straight, flat, strong	5
Skin and Coat.—Fine and soft, moderate quantity of straight silky hair	8
	100

OBJECTIONS.

Head.—Narrow forehead or dished nose.
Ears.—Thick, coarse or pricked.
Coat.—Coarse or curly, with rose; bristly mane.
Skin.—Wrinkled.

DISQUALIFICATION.

Colour.—Any other than pure black.

THE VEGETABLE GARDEN.

July.

By H. B. Terry, Cert. R.H.S., Lecturer in Horticulture, School of Agriculture, Potchefstroom.

This is the coldest month of the year, and frosts may be expected every night, especially on the high veld. It will be practically impossible to raise seedlings in the open except in sheltered positions. Frames or pits should be used for raising a few early plants of cabbage, tomato, marrow, and cucumber. In tropical districts where frost is rare, French beans, marrows, cucumber, sweet corn, tomato, etc., are sown or transplanted for early or succession crops.

Artichokes.—Jerusalem artichokes may be planted now. The tubers should be planted as soon after lifting as possible as they do not keep well out of the ground.

Asparagus.—New crowns should be planted this month, established beds should be well forked over and given a top dressing of well-rotted stable manure or kraal manure if not already done.

Rhubarb.—Winter (Topp's Crimson) will continue to give a supply of stalks if kept watered; crowns of the summer varieties should be planted now. Established crowns may be forced by placing old cement barrels or paraffin tins with tops and bottoms knocked out over the crowns; pack stable manure around the covers and loosely cover over the tops. Give plenty of water.

Seakale and **Chicory** may be forced in a similar manner to rhubarb.

Herbs such as thyme, marjoram, sage, and mint, should be divided and replanted.

Broad Beans may still be sown. If the earlier sown plants become frosted do not despair; they will break out again. In warm localities where growth is rapid, it is often necessary to nip out the growing point to cause the pods to set.

Cabbage.—Sow a little seed of such early sorts as Surehead, Webbs' Emperor, Enfield Market, St. John's Day, Winningstad. Give a little protection until germinated.

Lettuce.—Continue to sow Cos varieties. In warmer districts cabbage varieties may be sown again: Curled Neapolitan, Boston, Iceberg.

Peas.—Sow Stratagem, American Wonder, Gradus, Black-Eyed Susan, Marrow-fat. Lettuce or radish may be sown between the rows if the peas are sown 3 feet apart in rows.

Onions may be sown for salads; next month will be early enough to put in the main crop for summer.

Radish may be sown for succession; try sowing with lettuce between the rows of peas.

Tomatoes.—Under cover, or in a sunken pit, sow a tin of some early sort such as Carter's Sunrise, Earliest-of-all, Earliana, Bonnie Best; germination may be slow, but strong plants will be available for early transplanting should an opportunity occur. After germination give plenty of light and air to harden the seedlings off.

Turnips.—Continue to sow for succession, supply plenty of water, as a check will ruin the crop. Keep a sharp lookout for Bagrada Bug and endeavour to suppress it.

Kohl Rabi is hardier than turnips and often succeeds where turnips fail; both White and Purple Vienna may be sown.

Shallots.—Get these planted during the present month. Let the rows be one foot apart, about six inches between each bulb.

Potatoes.—It is too soon to plant, but the ground should be prepared, the sets obtained, and placed in shallow boxes to begin sprouting.

THE POULTRY YARD MONTH BY MONTH.

July.

By J. J JORDAAN, Poultry Instructor, School of Agriculture, Glen, Orange Free State.

Organization.—At the present time, co-operative organization engages wide attention. All sections are combining to watch that their interests do not suffer, but the real spirit should be to get an honest and square deal for the labour and capital one has invested. To keep up with the march of progress poultrymen must also organize, and the questions thus arise as to where, how, and when.

When to Organize.—This month a start must be made. Eggs are still a fair price, and the need may not be pressing, but what about September, October, November, and December next? They will then be a glut on the market, due to heavy production, competition, lack of control, over output, and various such causes; with low prices ruling and bills to meet, producers undersell each other.

If organization were undertaken now when the supply does not meet the demand, producers would learn to know each other better by then (and it is hoped as a result to trust each other also), the sources of demand would be more known, the good marks and so on. This would all tend to make for continued business during the "glut" period, and at prices ruling higher than would probably otherwise then be obtained.

If action in organization is delayed until then, no increased price can be expected, as the consumer has a large supply to draw from, and the eggs from the organized mark still being comparatively unknown, would not get anything more than the ordinary price, while the overhead charges of the organization would still have to be deducted from the members, so that many might become discouraged and drop out.

How to Organize.—One of the main reasons why co-operation has not proved so successful in South Africa in the past is on account of "big starts." This has brought about downfalls in more directions than one, but principally because mutual trust through personal knowledge of each other was difficult to attain. Start therefore in a small way. Half a dozen producers, say, might combine, each doing his share of the work entailed; eliminate overhead charges, but, above all, at the outset firmly implant the principle of loyalty.

Poultry clubs, farmers' associations, agricultural societies, should all assist in the formation of egg circles, egg depots, and so on. To get the best advice on such matters address the Poultry Instructor of the School of Agriculture nearest the district concerned, as local conditions, facilities, markets, supply, etc., must all be taken into consideration.

It will be necessary to form a small committee, as it generally does the most and best work. It would be an advantage if one of the members would undertake the necessary testing, grading, marketing, etc., of the eggs. A set of rules, that must be carried out without fear or favour, must be drawn up. Some central receiving place to which producers must bring or send their eggs should be decided upon, each supplier to have proper egg boxes for sending eggs to the depot and a rubber stamp to stamp his eggs with a distinctive number or mark, so that doubtful or bad eggs may be traced. There must be kept a proper recording system of quantities sent in, forwarded, disposed of, and amount realized. Each egg must be tested, so a proper testing lamp is essential. A supply must be obtained of commercial egg boxes to send all eggs to market from the depot.

Methods.—Eggs must be gathered daily and regularly sent in to depot, stamped with the producer's number: all doubtful eggs to be returned or destroyed. Careless or deliberate suppliers must be severely dealt with. This is vital. Eggs should be bought on a weight basis to encourage the production of a first-class article. Disposal of the eggs must be at the discretion of the committee; payment to be made to members monthly.

Buying.—The same body or association may act in buying stock birds, eggs for hatching, foodstuffs, and appliances for the members. It is suggested that each member might list his requirements for the month, these to be tabulated, and tenders called for the combined large order, each member taking his monthly turn at this work if necessary, if found too small to warrant the engagement of an assistant for the purpose. Payment might be made by debiting purchasers' egg supply account. On arrival distribution might be made at once and no storage need thus be needed. Through joint security advantage might be taken of favourable markets to buy the season's foodstuffs.

As an example of success from such joint action originating in a small beginning, the Cape Egg Circle at Claremont, Capetown, is worthy of imitation.

Organization Widely Necessary.—It is hoped that organization will take place throughout the Union. There is not a centre that does not need it, or is not calling for it, and only when there are large numbers of such small successful organizations throughout the country will Central and Federal organization prove the success they should be, for only then will "Loyalty" be the watchword of our co-operative movement

STAFF: APPOINTMENTS, CHANGES, ETC.

10/5/22 *A. M. Diesel, M.R.C.V.S.*, appointed Government Veterinary Officer at Bloemfontein.

1/5/22 *C. E. McCrea, M.R.C.V.S.* appointed Temporary Government Veterinary Officer at Middelburg, Cape

1/5/22 *S. Groot*, appointed Cheese Grader to the Division of Dairying and stationed at Queenstown.

1/5/22 *G. C. Hobson*, appointed Chief Inspector and Field Officer to the Division of Botany.

MOVEMENTS OF OFFICERS

A. G. Michaelian, Principal Sheep and Wool Expert, and G. J. Schuurman, Lecturer in Sheep and Wool, School of Agriculture, Grootfontein, Middelburg, Cape, will, as Inspectors of the South African Stud Book, commence tours of inspection of stud sheep for registration in the South African Stud Book. Mr Michaelian, after visiting the Bloemfontein area towards the end of June, will proceed to East Griqualand, and from there to Natal, and probably later on to the Transvaal, while Mr. Schuurman will visit the sheep districts in the Cape Province.

CITRUS CANKER ERADICATION.

INSPECTION WORK, MAY 1922

Farms Inspected—

Rustenburg District (Hex River Ward).—Buffelspoort No. 668, Buffelshoek No. 900, Bokfontein No. 647.

Pretoria District (Crocodile River Ward).—De Kroon No. 420.

Marico District (Groot Marico Ward).—Wonderfontein No. 11.

Fresh Infection—Nil.

Fresh Outbreaks—Nil.

Total Number Inspected—

Nursery trees, 564, trees other than nursery, 10,510. Trees found infected, nil.

Number of inspectors engaged, 20.

NOTES FROM THE "GAZETTE."

Attention is drawn to the following matters of interest which appeared in the *Union Government Gazette*:—

(Abbreviation: "Proc."—Proclamation; "G.N."—Government Notice.)

Gazette. *No.*	*Date.*	*Item.*
1234 1235 1238	19/5/22 26/5/22 2/6/22	The general disinfection and dipping of cattle as prescribed by the Stock Disease Regulations have been ordered:—(*a*) Every three days in the three-day dip for portions of Pietersburg; (*b*) every five days in the five-day dip for portions of Port Shepstone, Carolina, Piet Retief, Umzinto, Camperdown, New Hanover, Umvoti, Helpmakaar, Dundee, and Ndwandwe; (*c*) every seven days in the seven-day dip for portions of Lydenburg. (G.N. Nos. 787, 788, 826, 866.)
1234	19/5/22	Dr. Ethel M. Doidge, of the Division of Botany, has been appointed Acting Chief to the Division during the absence on duty of Dr. I. B. Pole Evans. (G.N. No. 802.)
		The District of Albert (Burghersdorp and Venterstad), the western portion of Prieska and a portion of Kenhardt, the District of Queenstown and the town of Fort Beaufort, have been declared Protected Areas against Scab. (G.N. Nos. 803, 812.)
		Brands registered under the various Cape Brands Registration Acts are notified in G.N. No. 804.
		At Klapmuts on 3rd August, 1922, various pieces of Crown Land in the Field Cornetcy of Achter Paarl will be offered for disposal by public auction (G.N. No. 805); on 5th August, 1922, Crown Lands will be similarly disposed of in front of the Magistrate's Office, Bredasdorp, and on the 9th August, 1922, Crown Lands in Mosselbanks River Field Cornetcy will be offered for auction in front of the Magistrate's Office, Malmesbury. (G.N. No 806.)
1238	2/6/22	An addition to the Fruit Export Regulations requires all exporters of citrus fruit, during the export season 1922, to pay an additional inspection fee at the rate of 5s. per 40 cubic feet. (G.N. No. 854.)
1241	9/6/22	Owing to an outbreak of wart disease in potatoes in certain areas in the Impendhle Division, the removal of potatoes, potato plants or parts of potato plants from such areas are restricted by regulations as provided for in Proclamation No. 90.
		In terms of the above Proclamation, regulations governing the handling, planting, and otherwise of using potatoes, as also for the destruction of infected tubers and plants, are in force. (G.N. No. 912.)
		Regulations for the export of dried fruit, controlling packing, weight of fruit, boxes, inspection, grading, etc., are published under G.N. No. 925.

THE WEATHER.

Extracts from the Monthly Weather Report of the Chief Meteorologist for the Union.

May, 1922.

MEAN pressure above normal over the western half of the Union; temperature about two degrees lower than usual, the deficit being equally divided between the days and nights; frosts principally during the first week and the middle of the month; an excess of rainfall over the greater part of the Transvaal, the north and north-east of the Free State, Natal, and the south and south-east coastal areas of the Cape Province—a deficiency elsewhere; an unusual number of hailstorms of light intensity; snow in parts of the Orange Free State, Natal, Kaffraria, portions of the north-east, and the Karroo, most widely from 14th-16th; a number of thunderstorms over the centre and east: such were the leading features of the weather of May, 1922.

The month presented certain peculiarities: The Cape Peninsula was mostly under fine summer conditions with a few days of unsettled showery weather, there was a failure of the usual rains in Namaqualand as well as a general shortage over the winter rainfall area, whilst a good portion of the summer rainfall area experienced an excess of precipitation. Except in the south-west and north-east, the rainfall was in excess over the Transvaal by amounts varying between a few hundredths and 1¼ inch (1.31 inch at Pretoria). A small surplus occurred in the north and east of the Orange Free State, whilst at Bloemfontein the rainfall was equal to the average; in the west and south, precipitation was sub-normal by quantities between 0.10 inch and 0.60 inch. An excess was general in Natal, ranging from half an inch to about 2¼ inches. There was, however, a small deficit in Zululand. In the Cape Province a supra-normal rainfall was confined to a comparatively narrow belt parallel with the south and south-east coasts from Mossel Bay to Kokstad, portion of the south-west, and to a few stations over the northern border, e.g. Upington and Kuruman. These excesses were mostly small in the south and over the northern border, but exceeded one inch over the south-east and Kaffraria. Elsewhere there were deficits increasing from a few hundredths of an inch over parts of the northern border and the northern Karroo to over an inch in the south-west, increasing to over 2 inches over the Cape Peninsula. The rainfall was mostly light, and occurred chiefly between the 10th and 15th over the greater part of the western half of the Cape Province, but exceeding 2 inches in places along the south coast, and 5 inches in Kaffraria on the 14th. Showers of rain or snow also occurred towards the end of the month between the 29th and 31st, being heaviest in Natal on the 30th, where quantities of 2-4 inches were recorded in some areas. Similar quantities were registered, but more generally in that Province on the 15th. Over the Transvaal rain fell over limited areas between the 1st and 3rd, but more widely on the 11th, 30th, and 31st. These latter rains on the 11th, 30th, and 31st also affected the Orange Free State, and were accompanied by wide-spread thunderstorms with frequent falls of hail, whilst snow covered the ground at Caledonia (District Harrismith) to a depth of 6 inches on the 31st. Snow also fell over parts of the eastern section of the Cape Province, Kaffraria, and at some stations in the south of Natal on the 15th. The snow attained a depth of 6 inches in the town of Kokstad itself, but was reported as 3-5 feet deep (probably in drifts) on surrounding farms; it was also 12 inches deep at Kilcullen (Barkly East), and 5 feet on the Drakensberg Mountains; the subsequent cold caused serious losses in stock, which were in poor condition as a result of drought Hills to the south-west of Cradock were topped with snow from 17th to 22nd. Hail (apparently mostly "soft hail" of medium size with occasional larger stones) was a common accompaniment of the thunderstorms of this month, particularly those of the 31st. In Durban the rain was peculiarly local—on the 31st, 1.74 inch was registered at "The Point," and 4 inches at one part of the town. Taken as a whole, although temperature has been lower than usual, there was a marked absence of extremely low temperatures.

THE OVERSEA MARKET.

MARKET PRICES OF SOUTH AFRICAN AND OTHER PRODUCE CABLED BY THE TRADE COMMISSIONER, LONDON, ON THE 17TH JUNE, 1922.

[NOTE.—Unless otherwise stated, (1) prices quoted are c.i.f. London ; (2) continental prices are c.i.f. Hamburg ; (3) *ex* store means in London ; (4) Cotton shows closing prices Liverpool ; (5) wool, mohair, and feather prices are at the auctions mentioned or in London : (6) butter, bacon, and cheese quotations are "spot" prices.]

Wool.—Fifteen hundred bales of South African privately-owned wool were offered during the week : prices showed a decline of 5 per cent. for greasies as compared with May auction. Four thousand four hundred bales of Government-owned South African wools were offered on 15th May, and practically all sold. Greasy combing wool is 5 per cent. to 10 per cent. cheaper. The tendency of the market is slightly lower for all classes of wool. The Continent is buying well, but the home trade is rather quieter.

Mohair.—The trade outlook continues healthy at prices ruling last week ; the demand is still for fine quality supers, winter hair showing no material improvement.

Hides.—The market is quiet, but the tone firm : there is no business of special interest to report. Wet salted Johannesburg 7d. to 7½d. Natal : wet salted 6½d., dry salted best heavy 8½d., dry best heavy 9½d., seconds 1½d. less

Skins.—Sheepskins are firm at last sales prices : Angoras and goat skins are unchanged.

Wattle Bark.—July August-September shipments to Hamburg for chopped are quoted at £9. 11s. 3d., and September-December shipments £9. 15s. to £10, but little business is passing at these prices. A small lot of chopped June-July shipments sold this week to Hamburg at £9. 2s. 6d. Extract is quoted at £25 to £26 per ton c.i.f. United Kingdom or continental ports, according to the quality, but the market is quiet.

Maize.—The market is very quiet. Buyers show little interest, except in American and La Plata maize. American maize is quoted at 29s. 6d. (12s. 3½d. per 200 lb.) for June-July shipments, and La Plata maize 33s. (13s. 9d. per 200 lb.) for the same position. Round yellow No. 6 was sold to Hamburg early in the week at 32s. 6d. (13s. 6½d. per 200 lb.) and on the 15th, 32s. 3d. (13s. 5½d. per 200 lb.) was accepted for both Flat White No. 2 and Round Yellow No. 6, August-September shipments. These are about to-day's value.

Maize Meal.—No business is reported. There are sellers at £7. 10s. per ton, but the value is not more than £7. 2s. 6d. for July-August shipments.

Ground nuts.—The market is dull, the value of West African undecorticated spot being about £18 per ton.

Ostrich Feathers.—Owing to the proximity of the coming auction, scarcely any business was done during the week.

Dried Fruit.—The market is very dull. South African Raisins, first quality, nominally 78s. to 80s., second 70s. Sultanas, bleached, in 25 lb. boxes, £5. 12s. to £5. 14s. : in bags £5. 7s. ; unbleached 95s., in 50 lb. boxes ; all per cwt., duty paid.

Butter.—The market is very firm. Australian 1st grade £9. 14s., 2nd grade 2s. to 5s. less, New Zealand 1st grade £9. 18s. to £10.

Cheese.—New Zealand 88s. coloured, 90s. white. Canadian new 84s. and 86s., according to quality. The market shows a slight improvement.

Bacon.—The market is unsteady. Danish £7. 14s. to £7. 16s., Irish £7. 16s. to £8, Dutch £6. 16s. to £7, Swedish £7. 4s. to £7. 14s., South African £4. 8s. to £5, East African 80s. to 85s., per cwt. ; all green Wiltshire sides.

Sugar.—America is quoting 21s. 9d. to 22s. per cwt. c.i.f. United Kingdom for granulated.

Cotton.—American futures : July 12·42d., October 12·17d., December 11·96d. per lb.

Fruit.—The citrus fruit per "Windsor Castle" arrived in very good condition. Prices : Oranges, seedlings 20s. to 25s., navels 25s. to 28s. up to 30s. per box. Naartjes, 4s. 6d. per tray, 10s. to 12s. 6d per box. Natal pineapples : These averaged 10s. per case, their condition being fair. There are still too many green fruit. Grape fruit, price 45s. to 55s. Trade is very slow owing to the large arrival of strawberries and other soft fruit.

WORLD CROPS.

THE ARGENTINE MAIZE CROP.

ADVICE has been received from the International Institute of Agriculture, Rome, that the Argentine maize crop this year is estimated at 3,964,000 metric tons, equivalent to 43,604,000 bags of 200 lb. The yield is as much as 32 per cent. less than that of last year, and is 11 per cent below the average yield of the previous five years

WHEAT CROP OF 1922

A special cablegram from the Institute, dated Rome, 20th June, advises that the wheat crop of the United States this year is estimated at 23,242,000 metric tons (1 metric ton - 11 bags of 200 lb.), which is placed at 7 per cent. greater than last year's crop and also 7 per cent. greater than the average crop of the previous five years. The wheat crop of India this year is estimated to be as much as 48 per cent. in excess of last year's crop, and 6 per cent. greater than the average crop of the previous five years, being returned at 9,976,000 metric tons. The cablegram states further that it is expected that the wheat crop in Canada, Japan, and Western Europe will be an average one this year, but that in Central Europe it will be poor.

AUSTRALIAN WHEAT MARKET.

Quotations for South Africa.

Mid-June, 1922.

[NOTE.- The Union does not produce its full wheat requirements, and the shortage is imported, both in grain and flour, mostly from Australia. The price of the Australian product influences largely the price of South African wheat, which, however, receives a measure of protection in that imported wheat and flour are subject to an import duty and differential railway rates. In addition, a dumping duty is in force at present. It is important that wheat growers of the Union should know the ruling price of Australian wheat and flour, and the Department has arranged to publish it monthly. Prices fluctuate, and it must be noted, therefore, that new quotations may be ruling by the time this is published.—EDITOR.]

Wheat (fair average quality), 12s 1d. per 100 lb.

Flour, 14s. per 100 lb.

The above quotations include cost, insurance, freight (15th June, 1922)

CROP REPORT.

CONDITION OF THE MAIZE CROP.

According to reports received from Crop Correspondents, it is estimated that this season's maize crop (European grown), as at the beginning of June, will produce 20 per cent. less than last year's harvest. A decrease is reported in all Provinces, the Transvaal being 15 per cent. less, Orange Free State 20 per cent. less, Cape Province 35 per cent. less, and Natal 25 per cent. less.

LOCAL MARKET PRICES.

RATES OF AGRICULTURAL PRODUCE AND STOCK RULING AT THE 15TH JUNE, 1922.

CENTRE.	Wheat. Per 200 lb.		Wheat Flour. Per 100 lb.		Boer Meal. Per 200 lb.		Mealies. Per 200 lb.		Mealie Meal. Per 180 lb.	
	Min. s. d.	Max. s. d.	Min s. d.	Max. s. d	Min. s. d.	Max. s. d	Min. s. d.	Max. s. d.	Min. s. d.	Max. s. d.
Cape Province—										
Aliwal North....	—	—	—	—	—	—	—	—	—	—
Beaufort West...	25 0	25 0	24 0	27 0	28 0	30 0	16 6	17 6	16 6	17 6
Capetown.......	24 0	25 6	—	—	—	—	14 6	15 6	—	—
East London ...	—	—	—	—	—	—	14 0	15 0	—	—
Grahamstown....	—	—	—	—	—	—	13 6	16 0	—	—
Kimberley.......	25 0	28 0	21 6	24 6	35 6	38 6	11 9	12 6	12 6	14 6
Kingwilliamstown	—	—	—	—	—	—	13 0	15 0	—	—
Port Elizabeth...	—	—	—	—	—	—	12 0	14 6	—	—
Queenstown.....	20 0	20 6	29 3	30 6	29 0	35 6	11 9	13 9	15 0	15 9
Natal—										
Durban.........	—	—	—	—	—	—	12 0	15 6	10 0	12 6
Pietermaritzburg.	—	—	—	—	—	—	12 0	12 6	—	—
Orange Free State—										
Bloemfontein....	23 6	26 0	25 0	35 0	37 6	42 0	9 9	12 0	11 0	14 6
Harrismith......	23 6	25 0	21 0	21 0	35 0	35 0	9 6	10 0	12 6	12 6
Transvaal—										
Pretoria........	24 7	28 0	—	—	—	—	10 10	13 0	—	—
Johannesburg....	25 3	26 3	—	—	—	—	10 0	11 6	—	—

CENTRE.	Barley. Per 150 lb.		Oats. Per 150 lb.		Oat-hay. Per 100 lb.		Lucerne Hay. Per 100 lb.		Potatoes. Per 150 lb.	
	Min. s. d	Max s. d.	Min. s. d.	Max. s d.	Min s d.	Max. s d.	Min s. d.	Max. s. d.	Min. s. d.	Max. s. d.
Cape Province—										
Aliwal North....	—	—	13 6	13 6	—	—	—	—	—	—
Beaufort West...	14 6	15 6	15 6	16 6	5 6	6 0	3 6	4 6	10 0	12 0
Capetown.......	12 6	15 0	12 0	13 0	6 6	7 0	6 0	6 6	7 6	15 0
East London ...	—	—	—	—	4 0	7 4	—	—	9 0	25 6
Grahamstown....	—	—	—	—	—	—	—	—	4 6	15 0
Kimberley.......	13 0	16 0	13 0	15 0	7 6	8 6	6 6	7 6	4 0	21 0
Kingwilliamstown	—	—	—	—	—	—	—	—	4 6	12 0
Port Elizabeth...	7 0	7 6	9 0	11 6	5 0	5 6	4 0	4 6	5 0	14 0
Queenstown.....	15 9	17 0	12 3	13 9	4 3	5 6	4 3	5 0	7 6	15 6
Natal—										
Durban.........	—	—	8 0	10 6	5 0	6 6	4 0	8 0	7 0	15 6
Pietermaritzburg.	—	—	—	—	5 9	6 0	5 9	6 0	4 0	8 0
Orange Free State—										
Bloemfontein....	14 6	19 0	11 0	14 6	5 6	7 9	4 6	6 6	8 0	12 6
Harrismith......	11 6	12 0	7 0	8 0	5 0	7 6	—	—	9 0	10 0
Transvaal—										
Pretoria........	—	—	—	—	5 0	7 8	—	—	8 0	16 3
Johannesburg....	9 9	10 6	9 4	10 3	2 0	8 6	4 0	6 6	2 6	13 6

CENTRE.	Onions. Per 120 lb.		Tobacco (Boer Roll). Per lb.		Beans Per 200 lb.		Beef Per lb.		Mutton. Per lb.	
	Min. s. d.	Max. s. d.	Min. s. d.	Max s. d	Min. s. d.	Max. s. d.	Min. s. d.	Max s. d.	Min. s. d.	Max. s. d.
Cape Province—										
Aliwal North....	14 0	14 0	—	—	—	—	0 3	0 3	0 4	0 4
Beaufort West...	17 0	18 0	1 3	1 6	50 0	65 0	0 6	1 0	0 4½	0 6
Capetown.......	6 0	11 6	0 6	1 0	30 0	55 0	0 4	1 2	0 6	0 8
East London...	11 0	17 0	—	—	20 0	34 0	0 3	0 5½	0 3½	0 6½
Grahamstown....	9 7	11 0	0 11	1 0	10 0	25 0	0 3	0 6	0 4	0 7
Kimberley.	8 0	16 6	0 9	1 1	15 0	35 0	0 4	1 0	0 4	0 7
Kingwilliamstown	12 0	18 0	—	—	18 0	33 0	0 1	0 4	0 2	0 6
Port Elizabeth...	4 0	11 0	—	—	15 0	32 0	0 6	0 10	0 6	0 10
Queenstown.....	—	—	0 9	1 0	—	—	0 3	0 4	0 3	0 6
Natal—										
Durban.........	9 0	14 0	—	—	15 0	40 0	0 3	0 8	0 3	0 7
Pietermaritzburg.	—	—	0 5	0 7	—	—	0 3	0 7	0 7	0 9
Orange Free State—										
Bloemfontein....	7 0	10 0	1 0	1 6	22 0	38 6	0 6	0 9	0 6	0 9
Harrismith......	—	—	—	—	—	—	0 3	0 6	0 4	0 7
Transvaal—										
Pretoria........	6 0	15 0	—	—	18 0	20 3	1·8d.	4·5d.	0 4½	0 7
Johannesburg...	11 6	13 0	—	—	16 0	30 0	—	—	—	—

CENTRE.	Fresh Butter. Per lb.		Eggs. Per dozen.		Cattle (Slaughter). Each.		Sheep. Each.		Pigs. Each.	
	Min. s. d.	Max. s. d.	Min. s. d.	Max. s. d.	Min £ s d.	Max. £ s. d.	Min. s. d.	Max. s. d.	Min. s. d.	Max. s. d.
Cape Province—										
Aliwal North....	1 6	1 6	2 6	2 6	—	—	—	—	—	—
Beaufort West...	1 9	2 0	3 0	3 6	5 0 0	9 0 0	10 0	22 0	20 0	100 0
Capetown.......	1 3	1 6	2 6	3 0	8 15 0	13 10 0	13 0	22 0	25 0	85 0
East London...	0 9	2 3	1 1	2 6	—	—	—	—	0 4*	0 8
Grahamstown....	1 2½	1 4	1 6	2 0	—	—	—	—	—	—
Kimberley.	1 3	1 7	1 6	3 9	8 0 0	12 0 0	10 0	13 0	0 2*	0 4½
Kingwilliamstown	1 0	1 9	1 1	1 9	—	—	—	—	—	—
Port Elizabeth...	1 2	1 5	1 6	2 8	—	—	—	—	30 0	97 6
Queenstown.....	1 6	2 0	2 3	3 0	7 15 0	8 12 0	14 0	20 0	0 4*	0 5
Natal—										
Durban.........	1 9	3 0	1 9	4 3	—	—	—	—	—	—
Pietermaritzburg.	1 10	2 4	2 0	2 5	—	—	—	—	—	—
Orange Free State—										
Bloemfontein....	1 3	1 6	2 0	2 6	9 0 0	12 0 0	15 6	22 6	0 4*	0 5
Harrismith......	1 6	2 0	2 0	2 6	5 0 0	7 0 0	15 0	20 0	20 0	40 0
Transvaal—										
Pretoria........	1 3	1 9	1 0	2 6	3 0 0	15 0 0	15 6	26 0	0 2*	0 5
Johannesburg...	1 3	1 6	1 3	2 0	5 10 0	14 0 0	9 6	24 0	0 2*	0 5

* Live weight per lb.

NOTE.—The rates quoted for produce sold in bags include as a general rule an additional 3 lb. for weight of bag.

THE LOCAL MARKET.

Position at Mid-June, 1922.

(NOTE.—The local market prices of certain agricultural produce and of live stock are published elsewhere in this issue.)

WOOL.

THE demand is still very good for most types but the market is now practically bare of stocks, and it is not expected that any further big consignments will arrive at the coast before September. Any odd lots now received at the ports are immediately bought up at satisfactory prices. Although prices are still firm, there are indications of an easier market in England, and if this continues there is every likelihood of the next wool season commencing on a much lower basis than has been experienced during the last few months.

The market values to-day are on a par with those quoted last month.

MOHAIR.

The market is very active for super summer firsts and the prospects for the immediate future appear to be quite good. With regard to summer kids, there has been a slight easing off in prices lately owing to the decrease in the demand. A fortnight ago up to 50d. per lb. was paid for super summer kids, but to-day the highest price obtainable is 48d. The market for other classes of mohair is firm and the prospects for the near future seem good. In regard to the Turkish trade, it is reported that business in mohair has been brisk and, with the exception of a few hundred bales which the owners refused to sell at any price, practically all the remaining old stocks of good or fairly good hair were cleared out at the end of March last. For the first time for many months past, arrivals had exceeded sales, most of the accumulation at shipping ports in Asia Minor having been rushed to the capital in the face of the increased demand and higher prices. A fair proportion of the new arrivals was eagerly bought up in many cases before being landed, but towards the end of the month demand commenced to slacken, and one cargo of about 2000 bales had to be taken into warehouse. Buying was not general, being almost entirely confined to two or three exporting houses, indicating that most of the purchases were for manufacturers' account, and they will consequently not come for sale on the Bradford open market. Some of the purchases are believed to be for American account. A sudden drop in the rate of exchange, however, coming about the beginning of April, made business very difficult, and it was not expected that much mohair would change hands in the near future.

Present local quotations are as follows :—

	per lb.		per lb.
Super summer kids	46d. to 48d.	Average summer firsts	12d. to 13d.
Average summer kids	36d. to 45d.	Winter mohair	6½d. to 7½d
Mixed kids	18d. to 24d.	Superfine Long Blue O.F.S. Hair	9d. to 12d.
First winter kids...	No stocks	" . . .. Kids	20d. to 28d.
Average winter kids ...	"	Basuto	10d. to 13d
Super summer firsts	15d. to 16d.		

SKINS AND HIDES.

Competition still remains firm for all classes of sheepskins and of hides, but the market for goatskins is easier.

The following prices were realized at the last sales

SHEEPSKINS.

	per lb.		
Sheepskins—sound	9½d.	Capes—salted ... ... each,	4s. 3d.
Sheepskins—damaged	8¼d.	Capes—damaged ... ... "	1s.
Pelts—sound	6d.		per lb.
Pelts—damaged	3¾d.	Coarse and coloured skins—sound ...	5½d.
Capes—sun-dried ... ... each,	3s. 2d.	Coarse and coloured skins—damaged	2⅛d.

GOATSKINS

	per lb.		per lb
Angora—light	3½d.	Goatskins—light	11½d.
Angora—heavy	2½d.	Goatskins—sun-dried	11d.
Bastards—sound	9d.	Goatskins—heavy	7¾d.
Bastards—damaged	4½d.		

HIDES.

	per lb.		per lb.
Sun-dried—sound	8½d.	Salted—sound	7⅝d.
Sun-dried—damaged	7½d.	Salted—damaged	6½d.
Sun-dried—fourths	3⅝d.	Salted—fourths	3⅝d.

OSTRICH FEATHERS.

Sales were held weekly at Port Elizabeth, the weight of feathers sold at the past five sales being 26,743 lb., which realized £32,353. There has been very little change in the prices during the past month, and at times competition was extremely dull. Advices from oversea show no indication of any improvement in the near future.

Meat Statistics.

EXPORTS.

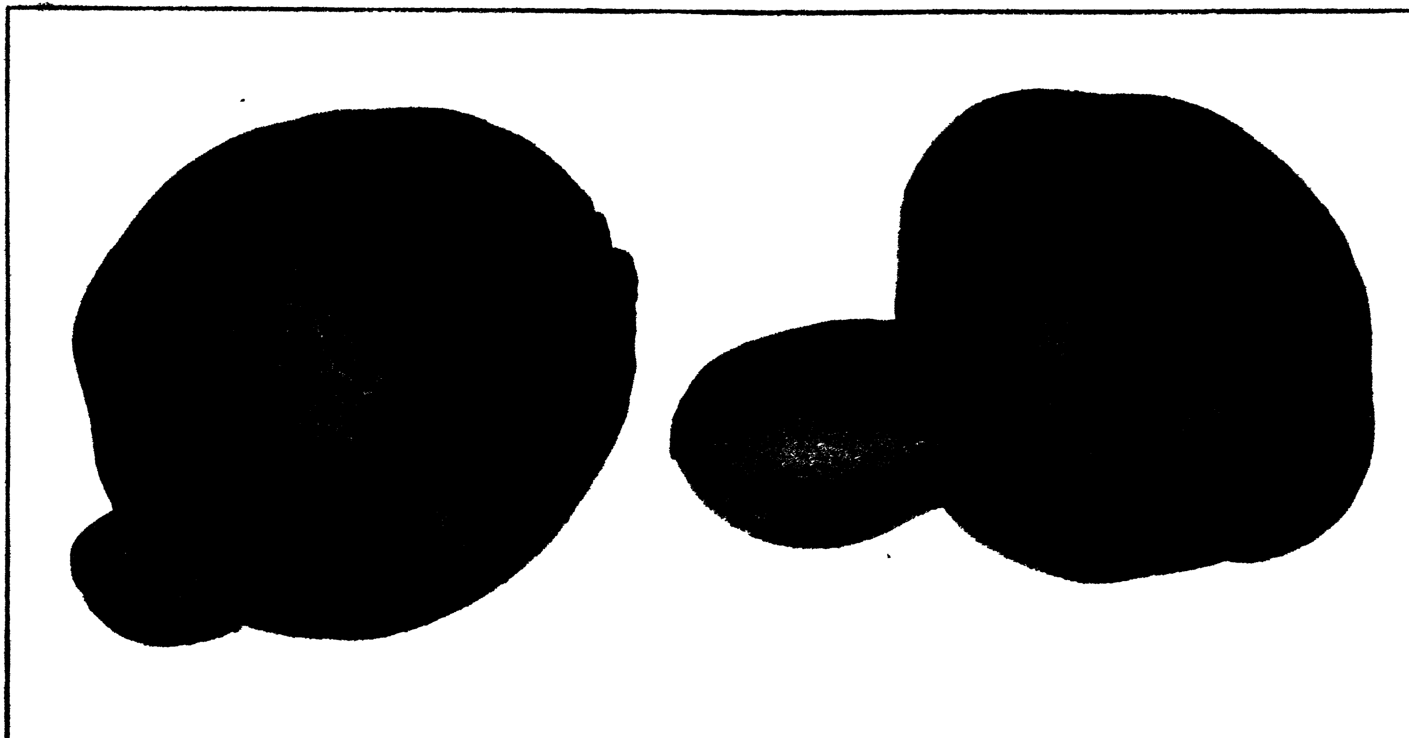
	May, 1922.	Total for Period 1st Jan., 1922, to 31st May, 1922.
Beef (quarters)	926	2,094
Bacon and Ham (lb.)	34,050	128,678
Bacon (sides)	—	740
Pigs (carcasses)	—	—

CATTLE IMPORTED FROM ADJOINING TERRITORIES.

For Slaughter	5,580	21,065
For Breeding	924	5,363

SUMMARY.

Calendar Year.	Beef Exported.	Cattle Imported from Adjoining Territories for Slaughter and Breeding.
	Quarters.	No.
1917	309,214	53,410
1918	123,354	50,058
1919	285,367	57,267
1920	69,885	89,135
1921	13,326	60,857



FREAK NAVEL ORANGES.

Sports from seven-year-old trees grown at Amanzi, Uitenhage, C.P.

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NOTES.

A New Feature.

Readers of the *Journal* will find in this issue the commencement of a new feature under the head of "Agricultural Inquiries and Replies." In announcing this addition in last month's issue it was pointed out that many letters are daily received by the Department from all parts of the Union which are attended to by the various officers qualified to deal with the problems they contain. These letters reflect in large measure current matters of farm practice that concern farmers as a whole, and it is considered that by selecting those of general interest and applicability much useful information may be imparted.

In order to make room for the above, the statistical matter and market intelligence hitherto contained in the *Journal* will in future appear with the crop report published monthly by the Department The enlarged publication will be entitled "Crop and Market Report," and will be issued towards the close of every month.

Common Potato Pests.

Following an article by Mr. G. J. Bosman on "Potato Culture in the Union" that was published in the July, 1922, number of the *Journal*, there appears in the present issue one by Mr. Bigalke, of the Glen School of Agriculture, who has compiled a useful number of notes on the root gall-worm, the potato tuber moth, and the potato ladybird beetle, pests that are responsible for much diminution in the returns of potato growers. The main features of these pests are given and how they may best be controlled, and for the information of those desirous of obtaining fuller particulars, reference is made to the literature on the subject. In regard to the latter it is pointed out that such as are published by the Department are obtainable on application to this office.

A Potential Weed.

South Africa, like other countries, has to contend with many weeds, and information on their occurrence and eradication has been widely disseminated by the Department. In recent years there has been a rapid increase of weeds to the detriment of our pasturage, and it is important that their spread should be stayed. While the question of eradicating the well-known weeds is, of course, of first consideration, it is well to be warned of plants that may develop into weeds unless their further spread is suppressed at once. Dr. Phillips, of the Division of Botany, draws attention in this number of the *Journal* to the dangerous presence of a plant (*Araujia sericifera*) introduced into South Africa many years ago and that is now spreading over the Union. It is a creeper and a prolific seeder, and as the seeds are well adapted for wind dissemination they are being scattered far and wide. While there is not much danger of the plant invading the natural veld, it has already become a nuisance in gardens and is likely to be one in plantations as well where, if allowed to grow unchecked, it has the power to smother tree growth. The article, which is illustrated, describes the plant, and Dr. Phillips advises that where these plants are found growing in gardens and elsewhere it is advisable to destroy them in view of their potential danger.

An Export Trade in Cantharidin Beetles.

In the November, 1920, issue of the *Journal* there was published an article on mylabris beetles, a large group of which are generally known as "blister beetles," and which have a commercial value. These beetles are dried and reduced to a powder, from which is obtained a crystalline substance known as cantharidin. This is occasionally used internally in minute doses as a stimulant and diuretic, but its principal use is in solutions, tinctures, plasters, etc., where a strong irritant is required. The *Journal* article (which is illustrated) deals with the life-history of these beetles, their food habits, uses, methods of killing, collection and preparation, etc.

An effort is now being made by the Department of Mines and Industries (Industries Division) to establish a local industry in connection with *Mylabris oculata* beetles ("Spanish fly" or "Boontje Keever"), which are a source of cantharidin and are found in many parts of the Union. Technical reports obtained from London on a sample of South African mylabris beetles indicate that there is a likelihood of finding a market in the United Kingdom for them, but before anything more definite can be said on this point it will be necessary to forward a commercial sample to London. For this purpose, Mr. E. D. Punter, P.O. Lead Mine, Koster, Transvaal, is acting in co-operation with the Industries Division, and will be prepared to receive collections of mylabris beetles from anyone in a position to supply, and prepare them for shipment to England. Persons willing to assist in this matter should communicate direct with Mr. Punter, who will give them full particulars of the proper method of killing and packing the insects. He will also make payment for the beetles at the rate of 2s. 6d. per pound.

A Library for the Farmer.

The public generally, and in particular the farming community, do not realize sufficiently the mine of information that is at their disposal in the library of the Department in the Union Buildings, Pretoria. Housed in a noble room, its spacious bookshelves of teak contain thousands of volumes of works on every branch of agriculture and other allied subjects. These cover a wide range of subjects, and among them will be found books of interest to every one, whether he be the scientific investigator or the farmer desirous of reaping the carefully considered advice of the world's foremost experts. The reading tables also are laden with current agricultural literature from all parts of the world, some 2000 periodicals and publications of that nature being received every month. The library is open to the general public during official office hours, but its usefulness is extended to the remotest farmstead of the country by the scheme under which ordinary books are lent out. At present there are only some 300 people who have availed themselves of this facility, possibly due to the fact that its existence is not generally known. In order, therefore, to acquaint farmers of the scheme, we publish hereunder the twelve regulations governing it. Any one desirous of becoming a subscriber should send to the Librarian, Department of Agriculture, Union Buildings, Pretoria, the required deposit of £1, together with 6s. for the annual subscription, who will furnish the applicant with the necessary forms for completion and advice regarding the list of books available.

The Regulations Governing the Loan of Books from the Library.

DEPOSITS.

1. Books may be borrowed on payment of a deposit of £1 or such higher amount as the Department may require in special cases, and of an annual subscription of 6s.

2. No one shall be entitled to borrow more than one book at a time.

3. The amount deposited will be applied in payment of any financial liability to the library of the person borrowing books. The deposit, or such portion thereof as remains after deducting any loss to the library by the action of the borrower, will be returned to the borrower on his request, but not while he has any book of the library in his possession.

4. Whenever a deduction is made from any deposit, the borrower shall pay to the Department the amount of the deduction before he will be entitled to the loan of another book.

5. Deposits are made for a period of not less than three months.

6. Books taken out of the library shall not be retained for longer than 30 days, but may on request be renewed for a further period not exceeding fourteen days at the discretion of the Department.

POSTAGE.

7. Books sent by post to applicants should be returned by post to the library under cover of the wrapper provided and forwarded for that purpose. No postage will be payable in that case.

8. The cardboards in which books are packed should be utilized when returning the books to the library, and care should be taken that the works are properly wrapped up.

9. Applicants will be advised of the dispatch of any books, and should at once inquire at their post office regarding any non-receipts, at the same time informing the librarian.

FINES.

10. Any one who fails to return a work within the specified time may be fined 1d. for each day that he keeps the book beyond the time appointed, providing the whole amount of the fine does not exceed the value of the book. Such defaulter can be refused the loan of another book from the library until the missing work has been returned and the fine paid. Within six weeks the defaulter must either provide a copy of equal value or pay the value of the book.

11. Any one returning a book to the library in any way damaged or destroyed is liable for the damage done, the amount of which shall be determined by the librarian unless the damage is due to ordinary wear and tear. Any one scribbling in or defacing a book may be fined by the Department not less than 1s. for each book so defaced or written in.

12. Any one who does not do so after receiving notification from the librarian to return a work shall be liable to a fine of 2s. 6d.

The well-known agricultural scientist, Professor L. H. Bailey, of America, states in one of his books that as far as he can ascertain not one farmer in four reads an agricultural book, bulletin, or newspaper. "It is all well enough," he writes, "that the farmer thinks in terms of experience rather than in terms of books, but a sound reading habit is essential to his progress and his success." So far as the Union is concerned, every endeavour is made to place before the farmer sound and timely literature in the form of the *Journal* and the various bulletins published by the Department from time to time. In addition, the wealth of the Department's library is available to him, and it is trusted that increasing numbers will seize the opportunity thus offered.

South African Ground-nuts: Oversea Confectionery Trade.

In last month's issue of the *Journal* reference was made to the satisfactory report received from the Trade Commissioner on two samples of shelled and unshelled ground-nuts from South Africa. In the course of the report it was pointed out that the quality of the samples was of such an order that they would readily be bought by the confectionery and fruit trade, for which purpose they would command higher prices than if bought for crushing or extraction. Further information on the subject has come to hand from the Trade Commissioner, who states that the sample of undecorticated nuts in question is considered to be equal in quality to the Chinese nut, but not in colour. When known to the trade, it is expected that the price our nuts of this quality would obtain would be about that ruling for the Chinese nut, which is 24s. to 26s. per cwt., although at present from 1s. to 2s. less per cwt. may be expected. In China, it may again be mentioned, the practice is to hand-pick the ground-nuts, reserving the better ones for the confectionery trade, and selling the remainder as second-grade to local mills for crushing.

The Mohair Trade: A Reprehensible Practice.

A well-known firm of wool and mohair buyers has written as follows to the Department, which wishes to associate itself with the firm in discountenancing the improper practice disclosed:—

"Reverting to summer firsts, we deprecate the practice, which has recently been in vogue, of speculators buying average firsts in certain districts and railing them to Graaff-Reinet and from thence to Port Elizabeth. This has been done in many instances, and, no doubt in order to have the Graaff-Reinet Station mark shown on the bales. We suppose that this has been done with the intention of endeavouring to delude the buyer at the coast, but instead of having the desired effect, we fear that it is only getting the Graaff-Reinet District a bad name. This practice does no good to the mohair trade in general and to Graaff-Reinet in particular. Personally, we have inspected many clips that are supposed to have been grown in the Graaff-Reinet District, but which bear a very strong resemblance to Jansenville mohair, which is generally looked upon as average summer firsts."

Wool Growers' Associations.

A movement of much importance to the wool industry of South Africa, initiated by the Grootfontein School of Agriculture, has recently resulted in the successful inauguration of wool growers' associations in the Graaff-Reinet and Middelburg Districts of the Cape Province. The wool growers of these two districts have decided to institute a system of careful classing and of particular attention to the breeding and care of sheep, so as to improve their wool production, and by means of inspection of sorting and packing of wools by qualified classers, ensure the sale of their wool under circumstances giving a guarantee of its standard. Wool which has not been so classed will not be permitted to bear the brand of the association. The objects are (*a*) to gain the confidence of wool buyers at the coast and other marketing centres, not only by means of producing the right type of wool, but also by getting up clips in the most efficient, honest and attractive manner; (*b*) to sell as many clips as possible on the same date in order to attract the competition of buyers; and (*c*) to assist members, if required, to classify their wool clips and flocks of sheep, and to select suitable rams.

There are other wool growers' associations that have been in existence for some years, but the present movement is expected to lead to increased activity in this direction. It has already been welcomed by the trade oversea, and the Principal of the Grootfontein School of Agriculture is assured of the hearty co-operation of the Principal of the Technical College at Bradford, the centre of the world's wool trade, in furthering the objects of the recently formed associations, the members of which realize that the secret of their success is the study of markets; the wool grower who thoroughly understands and meets the requirements of the manufacturer is the one who will make sheep farming a first-class proposition. The enterprise of those engaged in the movement is to be highly commended, and there is every reason to believe that their action will redound in credit and profit to themselves.

Codling-Moth in Pears. Dusting Experiments.

One of the most difficult and the most important phases in the farm economy of the fruit grower is the proper treatment of his trees in the control of insect pests and fungous diseases, and those who read the *Journal* will have learned from the frequent references to the subject that the Department is engaged in much experiment designed to ascertain for the guidance of growers the right materials of the correct strength, and the proper time of application, to be used in the suppression of these pests. In the September, 1921, issue of the *Journal* there was published a useful spray programme for pear and apple orchards in the coastal districts of the Western Province in connection with the control of codling-moth, red spiders, fusicladium, and red scale. Elsewhere in the present number of the *Journal* there appears a further article by the same officer, Dr. Pettey, Entomologist at the Elsenburg School of Agriculture, who deals with another aspect of the subject, that of power dusting. Experiments in this connection have been carried out at Elsenburg for some years, for the successful substitution of power dusting in place of spraying as at present would bring several advantages to the grower. Dr. Pettey relates the testing of the method at Elsenburg, and has come to the conclusion that under South African conditions dusting will not satisfactorily control codling-moth and fusicladium on pears. While in this respect it does not appear to hold any advantage, it is pointed out that dusting is destined to play an important part in the future control of insect pests, and is already being used with much success in the control of tobacco, cotton, potato, and other pests. It is a subject, therefore, of general interest to South African farmers, and the improvement of the method in regard to dusting machinery and materials will closely be followed with a view to its introduction on a wider scale in this country.

Pear Scab in the Western Province.

While Dr. Pettey has been engaged in various experiments connected with the insect pests, Mr. Putterill, of the Division of Botany, has been carrying on investigations in regard to the several plant diseases that are found in the Western Province, and his publications on the subject that have appeared in the *Journal* from time to time have been of considerable benefit to fruit growers. The Department has now published a bulletin* written by Mr. Putterill on "Pear Scab in the Western Province." It is attractively illustrated and explains the experiments carried out and discloses certain facts relating to the control of the disease. A study of this bulletin reveals the minute and thorough nature of the experiments which prove, among other things, the importance and necessity of spraying fruit trees four or five times, at least, during the season, either with bordeaux mixture or with lime sulphur. They demonstrate also the need of spraying at the right time if it is to be effective.

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* "Pear Scab in the Western Province," by V. A. Putterill, M.A., Bulletin No. 2, 1922. Obtainable from this office. Price 3d. prepaid.

The following sprayings, Mr. Putterill emphasizes, are essential, and should on no account be omitted:—

1. When the buds are breaking and the leaves just showing.
2. When the blossom buds have opened, but while the individual blossoms are still closed; that is about ten days later than 1.
3. When the last petals are falling; about ten days later than 2.
4. Ten days to two weeks after 3.
5. Five weeks later.

The practical side of the question in respect of the cost of spraying is also dealt with in the bulletin, both in the control of pear scab or fusicladium and of codling-moth, it being estimated that the sprayed tree will give a net return of 4s. over the unsprayed one, in addition to the improved vitality of the tree as a result of the spraying.

Government Scholarships.

In pursuance of the practice that has been carried out for several years past, ten scholarships were granted last year by the Government for the purpose of enabling promising South Africans to proceed overseas for a continuation of study of an agricultural nature. The names of the students receiving these scholarships and the subjects they proposed to qualify in were published in the November, 1921, issue of the *Journal*.

This year six scholarships have been granted, but not for oversea study. The establishment at Onderstepoort of the first veterinary college in South Africa was indicative of the progress of the country and of the importance of its pastoral industries. The farming community now recognize the outstanding services rendered by veterinarians in greatly extending the possibilities of South Africa in the raising of live stock, and are alive also to the need of ensuring our future development by making adequate provision for obtaining officers qualified to cope with the peculiar problems met with in the live stock industry of this country. The college at Onderstepoort is designed to meet this need both in men qualified to take up duties in Government service and to act as private practitioners, and it was, in view of the former, therefore, that this year the Government has granted six scholarships (£50 per annum for three years) for the assistance of students taking their course for the degree of Bachelor of Veterinary Science at Onderstepoort. A condition of the grant is that the recipient, on the satisfactory completion of his studies, shall be at the disposal of the Department for three years' service. The students selected are Messrs. M. Bergh, W. J. Green, C. Mare, J. Quin, Ph. Snyman, and J. G. Williams.

Mention may be made of the scholarships that are provided under the Orange River Colony Act, No. 34, 1909, but which are available only for children of the inhabitants of the Orange Free State. Four such were offered this year for study in animal husbandry, tobacco and cotton, and agricultural economics.

Different Methods of Curing Tobacco.

There has recently been a rapid increase in the world's consumption of cigarettes, therefore tobacco growers in the Union have less to fear from overproduction of this type of leaf than from the pipe and roll tobacco, for under existing conditions there is always the possibility of a profitable export trade in the light leaf which would be more difficult to establish for our surplus of dark leaf tobacco. In the Union during recent years there has generally existed a good demand for the various types of tobacco produced locally, and production consequently has developed until last year approximately 18,000,000 lb. weight of leaf was produced, a large proportion of which consisted of inferior or low grade leaf tobacco due in great measure to the present methods in vogue in the growing, curing, and handling of the crop. This large crop was in excess of the Union's requirements, not only in respect of inferior leaf, but also of the better grades of dark tobacco, though, on the other hand, the demand continued to be good for leaf suitable for the manufacture of cigarettes. It is clear, therefore, that the light type of tobacco offers the best market for the grower; correspondingly the return is also the highest, and it is the aim of most growers to produce this class of tobacco. Affecting very considerably the result of the season's crop, whether it will give a high percentage of light or of dark tobacco, are the conditions of soil and climate. Yet while some of our larger tobacco producing districts are favourably situated in so far as these two factors are concerned, they do not reap any advantage therefrom for their present methods of curing render the crop unfit for cigarette manufacture. It is estimated that, apart from the Turkish tobacco crop, the quantity of cigarette leaf obtained from the Union's crop is from 15 to 18 per cent. in the large producing districts of the Transvaal and 10 to 12 per cent. in Oudtshoorn, while in some other parts only 5 per cent. is obtained, the balance resulting in the various grades of pipe and roll tobacco.

With a view, therefore, to assisting growers desirous of producing a higher percentage of cigarette leaf, and also of showing how they may improve the quality of their tobacco generally, Mr. Oosthuizen, the Assistant Chief, Tobacco and Cotton Division, and Manager of the Experiment Station at Rustenburg, has written an article, published in full elsewhere in this issue of the *Journal*, explaining the various changes that take place in the leaf in the process of curing and the different methods that are employed in curing tobacco. Heat and moisture are the chief agencies that operate in the change of the green leaf to the cured one possessing all the desired qualities, and it is in the control of these two factors that a high percentage of cigarette leaf can be produced: for such a purpose a building is necessary. In the Union tobacco is cured either by air, flue, sun, or fire. But for the Turkish tobacco produced in the western districts of the Cape Province for cigarette manufacture which is all sun-cured, practically all the Union's tobacco is air-cured. The air-curing, indeed, is the oldest method in vogue, and the greatest portion of the world's production is still treated in this manner. And in the Union, in parts where the soil is suitable, high percentages of yellow leaf can be obtained from this method in most seasons; moreover, hitherto the few that have practised flue-curing (which is more

expensive than air-curing) have not met with a sufficiently encouraging response from the buyer to compensate them for their efforts. Therefore air-curing continues. But at the best it is speculative, for the grower is at the mercy of the elements, while with flue-curing he can control them and cure his crop successfully notwithstanding the state of the weather. In his article Mr. Oosthuizen explains the various methods of curing, and how they may best be employed.

The tobacco crop calls for skill throughout its various stages and is subject to so many vicissitudes, that of all farm crops it is entitled perhaps to the greatest margin of profit. Not the least of its exactions is met with after the crop is harvested, for then the leaf must be prepared for market, and however successful the grower may have been up to that point, bad management may render his product practically worthless. Mr. Oosthuizen deals also with this phase of the industry, and shows how success is to be met in the very important part of preparing the leaf for market.

Irrigation Dangers and their Avoidance.

It may be unnecessary, perhaps, to lay emphasis on the all-important part that irrigation must perform in the future development of the country, but its success lies in the hands of those who will depend on irrigation-water in their farming operations; and they have much to learn. To the casual onlooker it may appear that growing crops under permanent irrigation is much simpler than under a good rainfall. History shows, however, that the production of crops under irrigation demands much more skill and knowledge than their production under rainfall only. Vast sums of money have been lost through the ruination of land as a result of faulty irrigation. To those concerned it is a matter of supreme importance that they should be advised at the outset of the dangers that surround a practice that if wisely applied provides the most enduring kind of farming, but that otherwise is a danger with far-reaching results. An article brimful of irrigation truths is published in this number of the *Journal*. It is written by Dr. Turpin, the Lecturer on Crops at the Grootfontein School of Agriculture, and deals with irrigation in its relation to crop yields, soil, and brak. It is not proposed to particularize any of the many points so clearly made by the author; suffice to say that the farming public as a whole has yet to realize that it is not quantity of water that counts. Its injudicious application, indeed, leads to evils that may bring disaster both to the guilty and innocent. "If all farmers," writes Dr. Turpin, "will use their water sparingly, and will see to it that their lands are well drained naturally or artificially, I feel sure that most of our irrigation problems will disappear." This is surely an appealing fact in a country where water and not land is the limiting factor in plant growth. And as the crowning feature of irrigation, mention is made of its need for that spirit of co-operation which enables the farmer unflinchingly to consider his neighbour's interests with his own, and leads to the advancement of the national character.

The Quality of South African Wool.

Commenting on the prices obtained at Port Elizabeth for wool at the beginning of the year, a well-known Bradford authority states that it may be interesting to learn that the prices paid were so much above the market level in London or Bradford that one of the principal buyers has not yet been able to get back his own on what he purchased. The sentiments of buyers are being voiced when it is said that several of the clips sold at the sale showed unmistakable signs of being a little low in quality. Strictly speaking, several of them showed no more than super 60's quality, which is too low for South African produce. One of the largest buyers in Bradford states that samples of the wool bought at Port Elizabeth had been shown throughout the trade, and several parcels were described by all who saw them as being deficient in quality. This cannot go on indefinitely without strong complaints being heard. Some of the stud samples are just a little on the "strong" side, and breeders should certainly not lower their quality one single count below its present standard. If these rams were carrying fleeces three to four counts finer, they would be just about perfect when viewed from a manufacturing standpoint, which is the one which needs to be kept in mind. Several Australian ram breeders are breeding so-called merino sheep whose wool is no more than 58's quality, but no South African breeder should follow on such lines. No ram should be allowed to go out whose fleece is anything lower than super 60's. It is known that the wool of stud sheep is always of a lower quality than that of average flocks, and breeders maintain that the use of such rams is necessary to impart stamina to the rank and file of the flocks. This may be so, but there is no need to go to the other extreme. Quality is always an important factor in determining the value of merino wool. This, combined with length, determines its spinning capacity.

Lucrative Pig Farming.

Pig farming in the Union is still in its infancy, but its great possibilities of development in this country, which is well adapted for that class of farming, are being recognized and the industry has entered a stage of progress from which much is expected. A valuable series of articles designed to assist those who are engaged in pig farming, or who contemplate doing so, is being published in the *Journal*, the first of which appeared in the December, 1921, issue. The articles are written by Mr. Morkel, the Lecturer in Animal Husbandry at the Elsenburg School of Agriculture, who has made a special study of the subject, and is able to furnish practical advice on the up-to-date methods that are required to make the industry a success. A further contribution is contained in this issue of the *Journal* in which the origin and breed characteristics of the Berkshire, to-day the best known and most widely distributed of all British breeds of pigs, are described. This breed possesses characteristics that are well suited to South African conditions, and Berkshire boars have already done much in raising the standard of excellence of our grade herds. As a cross with the Large Black (sow) highly satisfactory results have been obtained in the production of baconers.

Anthrax: Contraction by Natives.

The Department has constantly warned farmers of the great danger to themselves, their live stock, and, indeed, to the well-being of South Africa, that exists in the presence of anthrax. Every farmer should now realize the danger and be well acquainted with the part he should carry out in staying the progress of the disease. He should view the present situation of the country with grave concern, for anthrax is very prevalent in parts of the Union, and is spreading with alarming rapidity. As an instance of how the disease is spread, the Secretary for Public Health draws attention to three cases of anthrax in natives due to the consumption of portions of the carcass of an ox which had died of anthrax on a farm in the Orange Free State. It is a pernicious and dangerous action to give dead carcasses of any kind to natives, and farmers are urged in the general interest to desist from such a practice in future.

East Coast Fever in the Transvaal.

When East Coast fever made its appearance in the Pretoria District about two and a half years ago there were hardly any dipping tanks in the infected area, with the result that the Department was unable to check the spread of the disease, and a large number of farms became infected before additional tanks could be erected. Today nearly 600 dipping tanks are in commission in the district (which consists of about 620 farms), and the Department is thus able to deal satisfactorily with the disease: it is gratifying to report that no further cases of the disease have occurred in the district during the past month or two.

Unfortunately the disease has recently made its appearance in Solomon Marabas' location, Waterberg District, some 10 miles north-east of Potgietersrust and about 80 miles from the nearest infection in the Pretoria District, due undoubtedly to an illegal movement of stock or some other illegal act which the Department has not been able to discover; there are, however, several tanks in the location mentioned and also on farms in its vicinity, and as dipping is being carried out in that locality, Minister's orders for the erection of tanks on all farms therein having been issued, it is hoped that the disease will be arrested and stamped out.

Owing to illegal movements the disease has also spread to three farms in the Witbank area, Middelburg District, but as dipping is now in progress on these farms it is hoped that the disease will not spread any further. It is feared, however, that by illegal movements of stock the disease may spread from the lower lying infected parts of the Pretoria District to the adjoining low veld parts of the Middelburg District, and in order to afford more protection for the cattle in those parts, the existing compulsory dipping area therein will be extended so as to include all farms situate between the Olifants River in wards Selons River and Secocoeni, and approximately the main road from Middelburg town to Pokwane location, etc. Minister's orders for the construction of tanks in this area have been issued, and Mr. Melt van Niekerk, of the Department, has recently held several meetings there with a view to explaining to the farmers the necessity for extending the compulsory dipping area and for the construction of the required tanks, also the assistance available to farmers in the shape of the supply of cement at cost price and the granting of loans by the Land Bank in terms of the Dipping Tanks Advances Act, No. 20 of 1911.

DEPARTMENTAL ACTIVITIES.

(NOTE.—The work of the several Divisions and Schools of Agriculture covers a wide range of agricultural industry in the Union, and we give hereunder notes and observations from certain of them treating with matters of special interest coming under their purview month by month. The object of these notes, which are not concerned with general routine work, is to inform the farmer of such matters as are calculated to be of interest and helpful to him at the present time.—EDITOR.)

THE DIVISIONS.

ENTOMOLOGY.

Figtree Mealy Bug.—This mealy bug, *Pseudococcus filamentosus*, is quite commonly mistaken for Australian Bug (*Icerya purchasi*), and is an insect which, in Pretoria at least, has proved a good revenue-earner, since it is the subject of innumerable telephone calls upon the Division from midsummer to frost. It is a considerable nuisance, because it wastes official time to no useful purpose whatever. In the winter and spring months the bug is out of sight, and therefore out of mind. It is on the trees, but reduced to small colonies, more like masses of spider's eggs than any other familiar object. These are to be found in sheltered parts, in wounds, in crotches, and against knots of the limbs and main stem. All the colonies on a tree can be got rid of in a few minutes search by dabbing each with a paint brush wet with linseed oil or other oily insecticide.

When the fig tree comes into leaf the bugs begin to multiply and migrate to the foliage and fruit, so that a tree may, as the season progresses, become filthy with white blobs of filaments. Bad as this pest may become, it has no lasting nor pernicious effect on the trees, and its zenith generally corresponds with the time when the leaves naturally begin to fall.

The Introduction of Pests.—The Natal Entomologist recently made an examination of a box of soil arriving at Durban from India with a view to ascertaining what life was in the soil and demonstrating the dangers attendant upon the importation of plants growing in soil. The soil yielded two venomous-looking centipedes, nine millepedes, three earthworms, one snail, two earwigs, five wire-worms, and several cockchafer beetle grubs. All of these, with the possible exception of the earthworms, were undesirable creatures, and their discovery vividly illustrates what a source of danger lies in the harmless-looking soil around a growing plant from oversea.

The House Ant.—Experiments on the control of the common and very troublesome house ant, *Pheidole punctulata*, are being carried out by the Natal Entomologist at Durban. Sodium cyanide appears to be giving very favourable results, but because of the extremely dangerous nature of this poison it is not at present recommended as a control measure. Sodium arsenite, sodium hyposulphite (hypo.), and vaporite were also tried, but so far the results with these are not encouraging.

VETERINARY EDUCATION AND RESEARCH.

Investigations into Nagana in Zululand.—Mr. H. H. Curson, Veterinary Research Officer, in this Division, was sent to Zululand in April, 1921, to investigate Nagana in cattle and other domestic animals. A short summary of his work during the ensuing year is given below, divided into three periods of four months each:—

Preliminary Inquiries.—May, 1921—August, 1921.—As the site selected for the Nagana Research Laboratory—Farm No. 273 in the Ntambanana Settlement, about 15 miles from Empangeni—was quite undevoloped, it was expected that buildings would be constructed, fences erected, and a bore-hole sunk during this period. Since, however, there were delays, I considered it would be an advantage to take a trip through the northern districts of the country, where Nagana has been a scourge for generations, and to make observations with regard to the history, geographical distribution and topography of the disease; and to note the association between the geology, zoology, and botany of the country, and the prevalence of Nagana. An opportunity was also taken at the same time to make inquiries into a disease of cattle along the coastal belt of Ingwavuma and Ubombo Districts. It was held by some that the malady was identical with Nagana, but as no veterinarian had visited the area, the matter required investigation, especially as the mortality had been severe in 1917, 1919, and 1920. On examination of diseased animals, all evidence pointed to the affection—known locally as "Swamp Disease" or "Munca"—being a parasitic gastro-enteritis, and worms sent to the Director of Veterinary Education and Research were later identified as *Haemonchus contortus* (wireworm) and two less common species, *Cooperia punctata* and *Cooperia pectinata*.

As a result of my trip I came to the following conclusions:—

Conditions under which Swamp Disease and Nagana Occur.—(1) The coastal belt is characterized by sandveld (except in the vicinity of rivers), which supports a vegetation giving but little shade, e.g. palms and grasses. This area has a warm and humid climate, is exceedingly swampy, more so as one approaches the sea, and is a hotbed of parasitic infection. In such places, sheep and goats cannot live and cattle in some seasons die to the extent of 25 per cent. Further west, however, between the Mbaswana and Mosi Swamps, where the country is well drained, cattle thrive, and in the middle of winter are fat and sleek, whereas at the same time of the year in Natal, Karroo, Free State, or Transvaal Highveld, animals are in poor condition, being walking skeletons.

(2) Further inland, varying from twenty to thirty miles from the coast, the veld is less sandy, consists in fact, in some places of alluvial soil washed down from the Lebombo Mountains. The vegetation here is of quite a different nature to that described in the previous paragraph, for instead of a minimum of shade, one sees bushveld varying from scrub with numerous glades to thickets or even vast areas of dense bush, e.g. Ipapa Bush in an angle formed by confluence of Usutu and Pongolo Rivers. I may mention that fossils collected by me in this area have been identified as being of marine origin by the Director of the Geological Survey. In this type of country, i.e. bushveld, Nagana is the disease most frequently encountered, being *enzootic* in the areas where tsetse flies are found, and *epizootic* around the enzootic areas. This state of affairs was noted not only in the Lower Umfolosi District, but also throughout the country. In enzootic centres, it would seem that wild mammals act as reservoirs and that tsetse flies are the chief transmitting agents, but in epizootic areas, domesticated animals take the place of wild mammals and biting flies, other than tsetse, are responsible for propagation of the disease. From observations made at Ntambanana, it would appear that there is good reason to incriminate species of *Haematopota*, *Pangonia*, and *Tabanus*. And (3) it also seemed clear (there are a few exceptions) that natural transmission could not take place on high veld, by which I mean elevations exceeding 1500 feet. As high veld is open grass veld, the importance of shade as a factor in natural transmission is obvious.

Erecting the Laboratory and Other Buildings.—September, 1921—December, 1921.—As the building material had now arrived, active progress was made in construction of laboratory, store rooms, sheds, and quarters for staff. Apart from three native handymen sent down from Onderstepoort, all buildings were erected by my lay assistant and stockman, to whose energy and untiring efforts, I am much indebted. The fencing of the station was also taken in hand, and water-boring operations carried out, the latter, unfortunately, with no success. During this period, routine work such as the examination of blood slides was commenced, and after the inspection of some hundreds of smears, it was recognized that the most frequent cause of Nagana was a small trypanosome known as *Trypanosoma congolense*, and that *Trypanosoma brucei*, hitherto considered to be the cause of Nagana in Zululand, was present on only rare occasions.

Tartar Emetic Treatment.—January, 1922—April, 1922.—As facilities now existed for the proper carrying out of investigation work, efforts were made to obtain some agent that would prove useful in cases where Nagana infection had taken place. It was realized that a specific was not available, and all that could be hoped for was some form of palliative treatment. After preliminary tests, it was decided to carry out on a large scale under field conditions, the tartar emetic treatment used in Portuguese East Africa by Jones in 1912, and later adopted by Hornby in North-East Rhodesia the following year. My policy has been to impress upon all farmers the importance of early diagnosis. If blood smears are negative, and yet the first manifestations of Nagana are observed, then no time should be lost in commencing treatment with tartar emetic.

THE SCHOOLS OF AGRICULTURE AND EXPERIMENT STATIONS.

GLEN, ORANGE FREE STATE.

The Need to Fallow.—Exceptional rains were registered during June, and farm work is in full swing. As this rain has been fairly general throughout the Province it is hoped farmers will take advantage of it and fallow the greater part of their maize lands for next year. The natural tendency, when it rains at this time of the year, is to sow as much wheat as possible. This practice cannot be deprecated too strongly. To expect any measure of success all land should be fallowed for some time before a crop is sown. As the latter part of the summer was too dry for ploughing, the bulk of the wheat will be sown on land as fast as it can be ploughed. This method is only courting failure.

The Maize Stalk-borer.—During the past season numerous complaints were made of the ravages of this insect, and a note at the present juncture may therefore be of interest.

The important point in the life-history of the insect is that during winter the caterpillars rest within the stumps, generally at the base just below the surface of the soil; they do not change into pupae until about the end of September or the beginning of October, and it is the moths derived from these over-wintered caterpillars that form the nucleus of the infestation in the following season. It is, therefore, of the utmost importance that measures be taken to destroy as many of the caterpillars as possible. The ideal method of accomplishing this is either to remove the plants, roots and all, at the time of harvesting, or to remove all stumps later in the season. Maize plants can be uprooted by means of a small plough set to draw a shallow furrow, or by means of the so-called maize-stump grubber. Maize stumps should be pulled by hand some time during August and burned in heaps. If the nature of the soil or a lack of labour does not permit of pulling by hand, a maize-stump grubber may be used. The question of maize stalk-borer control is discussed in detail in a publication entitled "The Maize Stalk-borer," by C. W. Mally, and maize farmers are urged to make a study of this. It may be procured from the Department at a cost of 1s. 6d.

Special Dairy Course Successes at the Maritzburg Show.—Under the supervision of the dairy staff the students attending the above course manufactured butter and cheese for competition at the show recently held in Maritzburg. Altogether two first prizes, two seconds, and two thirds (tie in one class) were awarded to the Glen exhibits.

At the Johannesburg Show a special dairy course Glen student won the students' buttermaking competition, and also the open championship (gold medal). An exhibit of dairy produce was also staged at the Johannesburg Show (not for competition), the experts remarking very favourably on the "finish" of the produce.

The special dairy course at Glen offers suitable training for men who desire to qualify for responsible positions in factory dairies. The staff are fully qualified, the practical men having had considerable experience in their respective subjects both in South Africa and overseas. The next dairy course will commence about the 11th October, 1922. For full particulars write to the Principal.

Short Courses.—The number of applications received for the short courses has been very gratifying. The sheep and wool and domestic science courses were fully booked up two weeks before the commencement of the course. Applications for the cattle and maize and poultry courses are still coming in, and, although these are not yet fully booked, the results so far exceed all expectations.

Experimental Results.—It is regretted that an error was discovered in last month's notes too late for rectification. It was stated that "the fallow plots contained nearly as much moisture as the plots under crop." The paragraph should read as follows: "An experiment was carried out at Glen during the past season to determine the relative effect of various methods of treatment of growing crops, viz., cultivation, harrowing, and weeding, moisture tests being taken in conjunction with the records of weight of crop harvested. Owing to the insufficiency of the rainfall—no rain of value having fallen after the middle of January—the plants in the test plots did not properly mature, and the results, therefore, were not as complete as hoped. Two points, however, were outstanding, viz., that the fallow plots contained more moisture than the plots under crop, and that the plots neither weeded nor cultivated in any way after the seed was planted gave about 25 per cent. lower yield than the plots to which attention was given."

GROOTFONTEIN, MIDDELBURG (CAPE).

Short Courses.—It has, unfortunately, been necessary to refuse many applicants for the short courses of instruction in sheep and wool that are being held this month, notwithstanding that more students have been accepted than can perhaps conveniently be handled. These courses consist of a five-day general course devoted to classing, judging, and care of sheep, followed by a second devoted entirely to the sorting, packing, and marketing of wool. To meet the demand, it has been arranged that a course similar to this second course will be held in September for the benefit of the members and their employees of the two Wool Growers' Associations recently formed in the Graaff-Reinet and Middelburg (Cape) Districts.

The success of this movement, which marks an important step in the wool industry of South Africa, largely depends on training the members to sort and pack wool in such a manner as to readily pass inspection, which, in the interests of all, must be maintained at a high standard.

Bradford Technical College.—Four ex-students of this institution are now undergoing training at the Bradford Technical College, and it is hoped at a later stage to obtain the services of some or all of them for the Department of Agriculture. One of these students, Mr. S. Mare, B.Sc., who gained an Honours Diploma in the Special Sheep and Wool Course at Grootfontein last year, and is now undergoing a course at Bradford, writes to say that in his opinion the South African student could not do better than attend the Technical College there, as it is the world centre of the textile industry. The college authorities are in close touch with the leading mill owners, and the students have every facility to follow up their training by a close study of actual processes carried out in the mills.

Lecturing Tour.—It has been arranged to devote a portion of the winter vacation to a comprehensive tour of the Eastern Province, during which the undermentioned towns will be visited and lectures delivered by the officers mentioned. Farmers will thus meet the various technical officers on the staff of the school, who will be available to satisfy inquiries on various subjects of interest, including dairying, crops, and diseases in stock: Cradock and Somerset East. Lectures in Sheep and Wool and Veterinary Science; Uitenhage, Lectures in Botany (diseases in crops); Willowmore and Oudtshoorn, Lectures in Ostriches and Entomology (parasitic diseases); and Graaff-Reinet, Lectures in Botany (diseases in crops). This innovation has received encouraging and enthusiastic support, which indicates that there is a growing appreciation of the services which schools of agriculture render to the community and an increasing need for co-operation between schools and farmers' associations. A word of thanks is due to the secretaries of those associations who, in spite of difficulties of communication, have succeeded in organizing successful meetings at comparatively short notice.

Extension Work.—The Research Chemist (Mr. A. Stead) has visited various farmers in the Graaff-Reinet District in the course of an inquiry as to the extent to which the aloe may prove possible as a food for stock in times of drought, and has collected interesting data. It is proposed to carry out experiments with aloes similar to those with the prickly pear which have been carried out at Grootfontein.

Other officers of the school have been engaged in lectures and demonstrations embracing a large range of subjects and including the following: "The Blow-fly," "Nodular Worm," and "Ear Tick," "Construction of Pit Silos," "Sheep and Wool." The Lecturer in Poultry, Mr. A. Owen John, attended shows at Queenstown, Aliwal North, and the challenge show at Port Elizabeth in the capacity of judge. At Queenstown there were 800 entries, while the Aliwal North show indicates that considerable progress is being made by breeders in that area. There were 830 entries at Port Elizabeth, including some very fine exhibits, notably in the Utility White Leghorn and Rhode Island Red classes. Mr. John also visited various settlers in the Sundays River Valley.

Greater Itinerant Activity.—The value of meetings with members of farmers' associations both to the farmers and the lecturers is fully realized, and it is a matter of regret that, owing to time occupied in the instruction of some 80 students at the school, the opportunities offered for this work are not as frequent as could be desired. Applications for assistance in this connection are always welcomed by the school, and every endeavour is made to meet them, but this is not always possible owing to difficulties in the train service and long distances involved, especially in cases where prolonged absence from Grootfontein is involved. It is confidently anticipated, however, that next year will see a marked improvement in facilities for extension work as a result of contemplated changes in the syllabus of the school designed with the object of releasing lecturers to a greater extent for research and itinerant work in the area served by the school.

Farmers' Week in Sundays River Valley.—Mr. A. Owen John, Lecturer in Poultry, has been largely responsible for arrangements in connection with a farmers' week in the Sundays River area during the latter part of September, when a number of officers of the Department will visit Addo and the surrounding district for the purpose of conducting a series of lectures and practical demonstrations on feeding, housing, selection mating, and breeding of poultry, incubation and chicken rearing, handling and marketing of eggs; laying-out of orchards, tree-planting, pruning, thinning, and gathering of fruit, spraying orchard trees; dairying, including butter and cheesemaking, and domestic science.

ELSENBURG, MULDERS VLEI.

Pig Management—Winter Litters.—As a general rule, it is not a good practice to have sows and gelts litter down during the winter months, particularly if the winters are severe in the district. It is a wiser policy to regulate the bulk, if not all, of the farrowings to take place in the spring and in the autumn, if breeding on commercial lines, and in the early or late spring only if breeding on pure-bred lines and primarily for show purposes.

Winter farrowing requires closer care and attention to detail if it is to prove successful. In parts of Natal and the Cape it is not, as a rule, required to warm the feed and drinking water, whereas in the Orange Free State and the Transvaal this will often be necessary. Work of this kind is all extra, and adds considerably to the cost of rearing a litter, although it must be admitted that it is often compensated for in the spring when the weaners should ordinarily be growthy enough to go ahead and make rapid and cheap daily gains, provided plenty of green succulent feed is available. In the Orange Free State and Transvaal very little, if any, green feed can ordinarily be expected in the spring, but in the Cape, April and May sown rape, kale, etc., will usually be sufficiently well advanced to warrant pigs being allowed to commence foraging it down as early as the end of June.

To ensure success in winter litters, the following important details require careful attention, and will be found useful in the management of brood sows at farrowing time generally:—

1. See that the sow is comfortably housed in a warm, well-lighted, and properly ventilated stye.

2. Keep the stye clean and dry, and add fresh bedding at least once, but preferably twice, a week. Do not use a lot of long dry grass or straw for bedding, especially when the youngsters are under 3-4 weeks old, as they will instinctively hide away under it, and so be lain on. It is best to use sawdust, particularly on a cold cement floor, whilst chaff is also preferable to long grass. A wooden sleeping-board, 5 ft. 6 in. by 3 ft. 6 in., placed in the cosy corner of the pen, can be used where sawdust, chaff, or other suitable bedding is not available.

3. See that the farrowing rails are in order. They should be about 9 in. high, and 9-10 in. from the wall of the pen. Fir spars,

old piping, or any other suitable rods can be used. These rails are of considerable help in protecting the litters of big clumsy old sows whose eyesight and hearing are seldom of the best.

4. Feed three times a day. It is better to feed in small amounts and often than in large quantities and at long intervals apart. The feed should be of a good sloppy consistency, and, if possible, separated milk should be used, together with some meal mixture, such as mealie meal, pollard, and wheaten bran in equal parts. During cold weather the feed should be heated to about bloodheat. On no account bring the mass to the boil, as this will render the feed less digestible, particularly the protein part of it.

5. In addition, some succulent feed such as rape, kale, cabbage, kaffir watermelons, makatans, green barley, and rye should, where possible, be fed. It is not advisable to use silage, except if of very good quality, and then not more than 3-4 lb. per sow per day.

6. Be on the lookout for scours in the youngsters. If found, the cause of the trouble can usually be attributed to the dam's milk. As a rule, it is the result of over-feeding the sow or of feeding too large a proportion of rich feeds, in both of which cases her milk is likely to become physiologically deranged. It is far better to slightly underfeed than slightly overfeed the sow. Immediately the youngsters are noticed scouring, cut down the sow's feed considerably. This is best done by thinning the slop to almost half the normal consistency. Scours in both the dam and her litter may sometimes be due to a dirty trough, especially if the concentrated feed is allowed to turn sour. It is a good practice, therefore, to clean the trough thoroughly each time before feeding, and also to sprinkle it with a little lime once or twice a week in order to neutralize the acidity.

7. "Black teeth" is occasionally met with and can easily be remedied. One or more pigs in a litter will be found to have an abnormally developed pair of central incisor teeth, which are black in colour. When such pigs attempt to suckle their dams, these teeth cut the teats, as a result of which the sow will refuse to let the litter suckle. Attention is drawn to this particular trouble when the sow's teats show distinct cuts and scratches, and the litter appears rather hollow in the flanks. The noise that the litter will make is usually the best proof of their perilous plight. The trouble may easily be remedied by the use of a pair of pliers for snapping off the elongated black teeth. The sow's udder and teats should be rubbed with a little sweet oil or raw linseed oil containing a dash of disinfectant, such as Hycol. If the udder is inflamed, it may be necessary to apply hot fomentations for a day or two.

8. Wherever possible, let the sow and her litter have the run of a small camp, so that they can take sufficient exercise to keep healthy. When the youngsters are about three weeks of age they will commence nibbling at their dam's feed, and extra feed should therefore be provided for them. Although satisfactory results may sometimes be obtained by giving the extra feed along with that of the sow, better results can be counted upon if a separate feeding-place is provided for the youngsters. A creep about 2 ft. 6 in. high and 5 or 6 feet long, with the spars placed about 5 in. apart, should be put at one corner of the stye, and shallow feeding troughs not more than 3 in.

deep should be put inside. This will allow the youngsters to obtain part of their requirements undisturbed, and they will therefore be less of a drain upon the sow. Especially is this true as the time of weaning approaches. In this way there is little likelihood of the sow overfeeding, whilst sufficient trough space is allowed the youngsters, and they should make maximum gains. The most suitable feeds for the little pigs at this time are the by-products of the dairy, fed in conjunction with some finely-ground meal. Separated milk slightly heated and mixed with pollard and mealie meal, or the meal sifted out from crushed oats and fed in equal amounts, and in the proportion of 1 meal mixture to 4 of milk, has given very satisfactory results. Butter-milk, whey, wheaten bran, etc., may also be used, but will not give quite such good results. The practice of scattering soaked grain, such as mealies, barley, etc., is recommended, as it not only teaches the young pigs to search for their feed, but is also conducive to their taking sufficient exercise.

9. If the number of pigs in the litter is above ten, those that are decidedly runty should be knocked on the head and buried. On no account should the sow be allowed to rear more than ten pigs. The remainder, if not too bad to destroy, should, if possible, be given to another sow. As a rule it does not pay to attempt to rear these by hand.

10. If breeding on commercial lines, the litters should be weaned at about eight weeks of age, but if breeding on pure-bred lines, and especially if the litter is fairly small, say, seven or eight, they can be left with the sow for another two or three weeks.

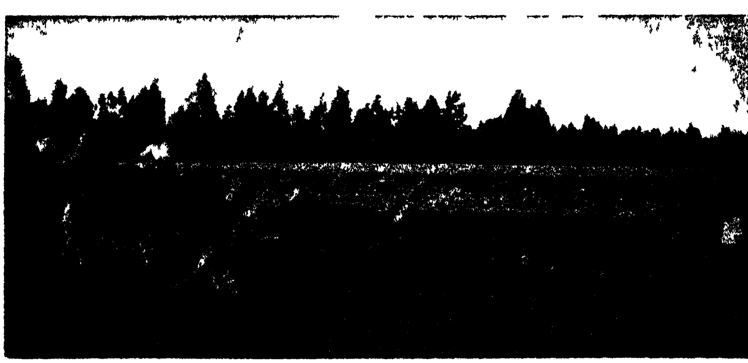
11. If some of the boar pigs in the litter are decidedly lacking either in type, constitution, or size for age, they should be castrated at six weeks of age. This will allow them to get over the operation by the time they are weaned. The doubtful boar pigs can be left over until they are about three to four months of age.

12. As a general rule it is not absolutely essential to ear-mark the litter before weaning in the case of winter litters, which should ordinarily be few in number, and therefore allow little possibility of a mistake being made. To be on the safe side, it is a good thing to mark your litters at this time, but one must be careful not to make the cuts too big or too small. The tendency is, as a rule, to make them too small, in which case it is extremely difficult to read the numbers when the pigs are matured. It is purely a matter of practice to know exactly how to mark them. Use the system of marking recommended by the Pig Breeders' Society.

13. It is a good practice, especially when the youngsters are warmly bedded, to rouse them up late in the afternoon, when they have settled down for the night. The object is to let them empty their bladders, for pigs have a tendency to keep to their warm nests and so do themselves a great deal of harm. A pig is different from other kinds of live stock, which will ordinarily excrete and urinate when they are lying down. A pig will not do this, except in a particular part of his pen, usually the corner farthest from his nest. This may seem a small point, but it is one of the many minor points that count in getting optimum results.

POTCHEFSTROOM, TRANSVAAL.

Horticulture in August.—The pruning of stone fruits and grape vines should be finished as quickly as possible, having regard to efficiency. Where trees are to be planted for orchard extension, no time should be lost in completing this work, as nothing except disappointment can be gained by delaying any longer. This month, too, will offer the last chance of applying any winter spraying solutions as many trees will be in blossom or leaf ere the month ends. Where any doubt exists as to the correct mixture to use as a " clean up " spray, the best results are to be obtained from " Capex " Lime Sulphur Solution, 1 part to 10 or 15 of water. After the blossoms open and green fly appears on the peaches and nectarines, the only safe remedy is tobacco wash applied regularly. August will be found the most suitable month for grafting over any unsatisfactory trees to more desirable varieties. Where it is intended to apply fertilizers around orchard trees, an early application of finely ground bonemeal or superphosphate at the rate of 400 to 600 lb. per acre should be made, and harrowed or forked in.



Students Loading Oats, Potchefstroom School of Agriculture.

Export Oranges and Quinces.

Commenting on a recent shipment of fruit from the Union, the Trade Commissioner, London, referred to a number of cases of oranges with counts of 288. These oranges were far too small, and it is strongly recommended that fruit of this kind, especially navels, should not be shipped as they are most difficult to dispose of.

A small parcel of quinces that had been received were still on hand and were practically unsaleable, a few trays only having been sold at 5s., notwithstanding that the condition of the fruit was excellent.

THE GREAT DROUGHT PROBLEM OF SOUTH AFRICA.

An Outline of the Interim Report of the Commission of Inquiry.

IN September, 1920, the Government appointed a Commission to inquire into the best means of avoiding losses by drought, and as a result of considerable investigation during the ensuing months, which necessitated travelling over a large area of the country, the Commission has presented an Interim Report* on its findings which, owing to the outstanding evidence that small stock farmers suffered most from drought, are concerned chiefly with that feature. The final report will deal with all branches of farming. This interim report is of the utmost moment to small stock farmers and, indeed, to every inhabitant of the country, for it discloses conditions that gravely concern the welfare of all and are a serious menace to posterity. It is proposed, therefore, to publish hereunder the findings of the Commission as disclosed in the Report, together with brief references to the arguments on which they are based, so as to assist in bringing to the notice of the public the problem that faces the country and how it is recommended to overcome it.

In introducing its Report, the Commission states that two points seem firmly established; firstly, that a large portion of South Africa was dry long before the white man arrived, as evidenced by the name "Karroo" and by the highly specialized drought-resisting flora of that region; and secondly, that since the white man has been in South Africa enormous tracts of country have been entirely or partially denuded of their original vegetation, with the result that rivers, vleis, and water holes described by old travellers have dried up or disappeared.

This drying out is still proceeding with alarming rapidity, and the following extract from the Report, written by the Commissioners deliberately and in full knowledge of its significance, reveals, as nothing else can, the fate that awaits the country with a continuance of present conditions: "It is unnecessary for your Commission to vie with the several writers who have, at various times, with facile pen depicted the gloomy and ghastly future which lies before our country. . . . The simple unadorned truth is sufficiently terrifying without the assistance of rhetoric. *The logical outcome of it all is 'The Great South African Desert' uninhabitable by man.*"

The Commission finds that the main causes of drought losses and the cumulative evils that they entail are the kraaling of stock, occasioned mainly by the jackal, inadequacy of the drinking water facilities, the destruction of vegetation and the resulting soil erosion, which

* Interim Report of the Drought Investigation Commission. Obtainable from the Government Printer, Pretoria. Price 2s.

in turn leads to a diminishing efficiency of the rainfall. These factors are discussed in the report in the order given hereunder.

RAINFALL.

When seeking the cause of the ever recurring droughts, periods when natural veld grazing has become so scarce, and the supply of water at the drinking places so diminished, that loss of stock results, the question of rainfall is of first consideration. This still engages the attention of the Commission, but no evidence has been brought forward to prove that the average rainfall in South Africa has changed during recent historic times. Variations occur and there are good and bad years, but there is no definite tendency traceable of either an upward or downward direction. Personal reminiscence is misleading: there are many people who assert that the nature of the rainfall has altered and that the gentle, soaking and regular rains of yore are giving way to innumerable small and useless showers or to violent and devastating thunderstorms. Be this as it may, it must be conceded that the rains of last generation fell on unbroken, understocked grazing lands, and were more lasting in their beneficial results than rains of equal magnitude falling to-day on veld overstocked, tramped out, semi-waterproof, hard-baked by sun and veld fires. Herein, indeed, lies the kernel of the drought problem: while the quantity of rainfall received shows little variation, its *utility* has certainly diminished for the quantity that is absorbed by the soil is continuously decreasing.

The Commission outlines the position briefly as follows:—

1. No proof was submitted that the mean annual rainfall of the Union has altered appreciably within recent historic times. Nor is it considered likely that such a change has taken place.

2. According to the evidence of many witnesses there has been an alteration in the nature of our rainfall within the last few decades. No measurements have as yet been submitted either supporting or rebutting this statement; but it is well within the bounds of possibility. There is nothing to show whether this alteration, if it exists, is a permanent or only a temporary change.

3. While the mean annual rainfall remains constant its economic value has to a very great extent been reduced by the alteration in the properties of the surface of the country for which man is responsible. In this reduced utility of rainfall must be sought the secret of our "droughts."

KRAALING OF STOCK.

South Africa is essentially a pastoral country, the greatest portion of it being devoted to animal husbandry, and as a general rule all live stock are dependent for their sustenance on the natural veld herbage. And it is over the areas where small stock farming is practised that the effects of drought are most severe, so that it is from this quarter the causes are to be sought. Most farmers kraal or concentrate their small stock at night at certain fixed places, due largely as a protection against the depredations of the jackal. But

the animal that is kraaled leads an unnatural life. Left to itself the sheep grazes during the early morning and late afternoon, rests during the heat of the day, and sleeps through the night. To-day he is driven to and from his kraal to pasturage at a time when he should be browsing, and as good pasturage recedes further and further from the vicinity of the kraal, particularly as the winter progresses, so has the unfortunate sheep to spend more and more of his proper feeding time in journeying to the distant veld. Then the exertion entailed by these journeys increases the animal's food requirements, and this extra need during seasons of scarcity is often just the deciding factor that results in death; for the free ranging sheep is better able to sustain life (by drawing on the reserves of fat and flesh of its own body), being able to live several weeks without food, provided it has sufficient water and also the proper rest that the driven sheep is denied. Thus the kraaled sheep has not the same chance to acquire robustness (which affects the value of the wool as do also other kraal induced evils, such as scab) as the free one. Evidence shows that where sheep run day and night in suitable paddocks, losses are rare, for they are able to find whatever fodder remains on the veld and so postpone the call on their body reserves to the latest moment, whereas the kraaled sheep, denied the opportunity of foraging at will, succumbs.

The Commission finds:—

1. The kraaling of small stock, which forces the animal to lead an unnatural life, is the prevalent practice among farmers throughout the Union.

2. The kraaling system necessitates much driving of stock and an increased food requirement, which is particularly disadvantageous in time of drought.

3. Driving is detrimental to the condition of the animal, and seriously endangers life when, through the effects of a bad season, it is in a weakened state.

4. Apart from its action on the sheep during times of drought, kraaling, as a general practice, is at all times detrimental to the health of the animal and the value of its wool.

5. Experience has shown that the system of running sheep day and night in suitable paddocks is attended by very small drought losses.

6. The abandonment of the kraaling system is a necessary step in the reduction of drought losses.

OVERSTOCKING.

It is extremely difficult to decide upon the number of stock a farm can carry from year to year, for the rainfall which determines the amount of grazing produced varies tremendously from season to season. There are other factors also that have to be considered, and taken together they present such variations that a particular farm may carry double the number of stock in some seasons that it can in others. Stocking a farm is, therefore, speculative, especially as (which is, unfortunately, the practice), no provision is made for feeding stuffs in the event of a bad season. It is naturally the intention

of the farmer to make the most use of his veld, and as a result it is frequently overstocked. This leads to overgrazing, which compels an increased movement of stock, as they have to forage over a wider area to obtain their food requirements; this again tends to the trampling out the veld, and demands the extra energy and thus the greater food requirement of the animal. Animals on such a farm are not in the same condition to meet a drought as are those on farms carrying less stock. But above all, overgrazing results in the denudation of the vegetal covering of the veld, and is the source of many ever-increasing evils.

The Commission finds:—

1. The practice of overstocking farms is very prevalent throughout the Union.

2. Several causes are responsible therefor, among which are extreme seasonal variations and the optimism of the farmer.

3. Animals on overstocked farms go into drought handicapped by a low condition, as well as little food in prospect, which circumstances lessen their chance of coming through the drought.

4. The reserving of fodder for use in times of scarcity is a very unusual practice.

5. Overstocking leads to overgrazing and all its attendant evils.

6. Largely responsible for drought losses is the almost universal practice of overstocking the farm, and a failure to make any sort of provision for the drought, which the farmer knows will come on him sooner or later.

WATER SUPPLY.

It is found that on many farms the number of watering places is insufficient, and further, that, generally, watering places are not kept sufficiently clean, and thereby impair the health of the animals using them. Moreover, the consequent need to drive stock long distances to watering places has the same evil consequences as sending them from the kraal to the distant veld for pasturage. An animal can live for several weeks without food by drawing on the reserves of food stored in its body, but it has practically no reserve of water. For the functioning of its body water is essential, and, moreover, as the drought proceeds, the animal requires an increased supply of water to enable it to digest and dispose of the dry, fibrous matter obtained from the veld at such times. But at such time water is scarce and many animals die, while the stock are congregated around the watering places, regardless of the food supply surrounding them.

The Commission finds:—

1. Water is the essential of life, and the provision of adequate supplies of it is a prime necessity in fighting droughts; that Government should encourage farmers in every way possible to improve the water resources of the farm, and that improvement in this direction will act very materially in fighting drought.

DETERIORATION OF THE VELD.

It is of vital importance that the vegetal covering of the country should not be impaired. for from it not only does the animal obtain

its sustenance, but in its absence the rainfall runs off easily, its efficiency is diminished, and the soil is eroded. The congregating of stock, as practised at present, leads to much destruction of the vegetation by trampling and overgrazing. A characteristic of areas of low or intermittent rainfall is the high proportion of perennials in its vegetation, a provision of nature in that having established a well-developed root system they are able to make the fullest use of the rain when it comes, and are in vigorous growth before the annuals have had time to germinate. Perennials under natural conditions are thus able to thrive with a scanty rainfall and also to repress and mask the existence of the annuals. Destroy the perennials and the annuals will have all the rainfall and become increasingly prominent, but will more readily die, for, unlike the former which are able to go into a resting condition between rains, annuals need a sufficiently moist soil to make growth continuous. Veld composed of annuals, therefore, is less certain of being able to carry its quota of stock throughout the year. Yet on an overgrazed veld perennials, which spring into edible growth first, are eaten down before they are able to manufacture their full reserve food requirements, and if this process is continued the plant dies. Palatability also plays its part, so that the perennials the animal most likes are first eaten, and gradually they disappear from the veld until in overgrazed parts the surviving plants are those of an undesirable and uncertain type.

Overgrazing is most detrimental to the veld when growth is most active, for instance after a drought breaks, for this rapid growth after plenteous rain determines, not only how much fodder there will be for the coming dry period, but also the amount of storage of rootstock, bud and seed, and through this the yield of fodder in the coming year. Thorough grazing subsequent to this period is not so exhaustive; investigations in America show that by reducing the number of stock during the main grazing season (which is not possible on the overstocked, unpaddocked farm) to about half the average number the range can carry for the year, thereafter grazing fully for the remainder of the year (eight months), the range so treated improved as much as similar ranges protected for the whole year. So with the valuable Karroo fodder plant, the "skaap bos," it is evident that resting is necessary, and that nothing is more harmful than overgrazing at its period of active growth.

When a farm is divided into camps and the grazing can be regulated, the animals will be compelled to eat all the veld growths, notwithstanding their degree of palatability, that are not harmful, so that all useful plants get an equal chance when the camp, in the course of rotation, is rested. Where this is not practised, the stock naturally confine their choice to the most palatable shrubs, leading to their destruction and the spread of the less palatable ones.

The chief causes, therefore, of the daily deterioration of the veld are kraaling, scarcity of suitable watering places, and overgrazing. And this deterioration in itself induces accelerated speed in its career of damage by resulting in the ever-growing need for greater movement of stock to find food and water, leading to overgrazing and the mechanical destruction of the veld, first the palatable perennial and finally the remaining herbage. Then comes the culminating evil—the diminishing efficiency of the rainfall. As the vegetal covering becomes scanty, so is the run-off of the rainfall accelerated, and less

water becomes available for plant requirements, a serious matter when water is the limiting factor in such plant growth. Just as serious also is the increased evaporation that ensues, due to lack of the protection the otherwise closely growing herbage would have afforded, and which also robs the plant of the moisture it requires. And so as the veld is denuded of its covering, the loss of moisture due to increasing run-off and evaporation may become so rapid that in time the total amount of rainfall that is made available is so scanty as to be insufficient to support the original vegetation. When that time arrives rapid deterioration sets in.

The Commission finds:—

1. The kraaling and herding of stock leads to a mechanical destruction of the vegetal covering due to trampling.

2. The lack of a sufficient number of drinking places gives rise to a similar result.

3. Overstocking not only leads to trampling, but also to overgrazing.

4. Overgrazing tends to destroy perennial fodder plants and encourages the growth of annuals and plants useless for grazing purposes. In this way the grazing yield of a season is diminished and depends more and more on frequent rains.

5. The effect of overgrazing is very serious when it occurs during the main growing season.

6. The farmer should therefore endeavour to reduce intensive grazing at this period.

7. This he can do if his farm is divided into paddocks, for such a sub-division permits of the best possible distribution of the stock over the farm, and allows of absolute rest for paddocks that require it.

8. Complete grazing control is the first essential of a system of stock farming that will prevent deterioration of the vegetal covering.

9. Animals in poor condition graze more destructively than if in good condition.

10. Reserves of fodder for use, when grazing is scarce, are very valuable, not only for keeping stock alive, but also for preventing overgrazing at the critical time when vegetal growth is very active.

11. Even if no permanent damage is done, overgrazing at the period of active growth seriously diminishes the following yield of fodder.

12. Deterioration in the vegetal covering of the drier parts of the Union has been brought about, mainly through the practices of kraaling, herding, and overstocking, together with an insufficient number of drinking places, and overgrazing.

SOIL EROSION.

The processes outlined above that are leading to the destruction of the country's natural herbage and to periodic drought losses, also lead to soil erosion. There is erosion of cultivated lands, a matter of extreme importance, as well as of the veld soil, but the Commission confines itself to the latter, pointing out that the soil of South Africa

is being rapidly eroded, (*a*) by surface erosion by wind, (*b*) by surface erosion by water, and (*c*) by donga or sloot formation. The surface erosion is the most dangerous, insidiously eating away the soil of the Union, which is a *definitely limited and irreplaceable quantity*. This being so we are morally and economically bound to conserve it. Erosion by slooting is always evident, while surface erosion frequently takes place without being easily noticed, but by removing great layers of the country's most valuable soil and plant food, it is causing enormous loss. The wind is similar in its action, removing first the rich surface soil which has taken centuries to form. Sometimes it bodily removes ploughed fields, but the greatest damage is caused by the strong dust-bearing winds that sweep the country. While water carries the eroded material direct to the sea, the wind may carry it in all directions, yet its ultimate destination is in the direction of the prevailing wind of the dry season.

In addition to surface erosion, and greatly assisted by it, proceeds the slooting of the country, that is, the cutting up of the veld by runlets and gulleys, which eventually form the deep water courses known as sloots or dongas, and which remove both soil and water. The gradual deepening of these sloots increases the gradient of the surface water on its banks, and innumerable branch sloots eat their way back from the banks, and in this manner all the surface soil is eventually removed in the vicinity of sloots, and the resultant bareness produces an increased run-off. The latter running into the sloots aids in the undercutting of their banks, increasing the size and multiplying the number of the sloots. Thus the damage is accumulative, and so it proceeds each year.

Water which should have soaked into the ground to feed plants and replenish the underground supply, is carried to the sea, and in eroded areas, badly slooted, the level of the water table is continually receding, constituting an economic loss, as the sinking of the water table connotes greater labour in making available underground supplies. The ever-increasing sloots with their accelerating run-off, result in river floods, which may be expected to increase in severity with the years, but decrease in time of flow, while periods of no flow will naturally become proportionately longer.

In this way irrigation enterprise, on which the country so greatly depends, is hampered, frequently being made uneconomic owing to the costly protective and other works needed to cope with high and low floods, and as a consequence increasing the cost of producing foodstuffs in this country. The remedial measure recommended is to build reservoirs for the purpose of regulating the flow, but the silt brought down reduces the useful life of the reservoir, and adds to the cost of the scheme. There are parts where the silt carried down by rivers is useful, but this is not always the case, as in some instances the very fine silt chokes or suffocates plant growth, so that its presence in water renders it unfit for irrigation, while in many other cases coarse material brought down kills off all vegetation. But the greater portion of the silt finds its way, unused, to the sea.

The erosive power of water is enormously increased by concentration and increased velocity which are brought about by such factors as climate, temperature, humidity of the air, the annual rainfall and its intensity, composition of the soil, its situation, prevailing winds,

etc. A big controlling factor is the amount of vegetable covering by which the soil is protected. When left to herself Nature arranges a state of balance between the various factors. When Man arrives and upsets the balance by destruction of the vegetation, trouble results. And in the latter respect the small stock farmer by his wasteful system of veld management is an outstanding cause of erosion, for his present system of grazing is detrimental to stock, vegetation, and veld.

Happily, the interdependence of the factors that lead to the present position, enables the employment of one remedy, viz., improved methods of veld management, by which the evil effects of all can simultaneously be remedied. This is as necessary for the welfare of future generations of the Union, as for the saving of the flocks and herds now grazing on our veld.

The Commission finds:—

1. That soil erosion is extending rapidly over many parts of the Union.

2. That, besides slooting, there is a great deal of surface erosion, both by water and wind, taking place.

3. That the soil of the Union, our most valuable asset, irreplaceably and definitely limited in amount, is being removed in enormous quantities annually.

4. That the greater part of this soil and valuable plant food is lost for ever, and while the remainder of the eroded material may do good in some instances, it does much harm in others.

5. That one great damage done by the eroded material is in silting up of reservoirs, and that soil erosion causes a greater irregularity in the flow of our rivers, thereby increasing the cost of irrigation works and the cost of producing feeding stuffs.

6. That soil erosion is causing a marked decrease in the underground water supply of the Union, and thereby increases the difficulty of watering stock.

7. Soil erosion is caused by reduction of the vegetal cover.

8. That soil erosion has a cumulative character which, by virtue of the similarity between its cause and effect, always accelerates its rate of growth, in all except a few favoured portions of the Union.

9. That prompt action is therefore imperative.

10. That soil erosion is caused, mainly, by deterioration of the vegetal cover, brought about by incorrect veld management, and that all efforts to improve the latter will have a beneficial result on the former.

IMPROVEMENT OF FARMING METHODS AND CONDITIONS.

While the present system of small stock farming is leading to such serious damage, evidence shows that by the adoption of the principle of free ranging an increase of 75 per cent. was carried on a certain farm without damage to the veld, and which, on the contrary, actually improved. Other farmers have had similar experience. Yet the present system is continued because of: The presence of the jackal, which necessitates kraaling; the scarcity of natural water supply for the drinking places which must be provided in every camp

if paddocking is adopted; the want of capital required to erect the necessary jackal proof and other fencing, and to provide water for the paddocks; the presence of roads—many of them unnecessary—which make the lay-out of a suitable scheme of paddocking extremely difficult, or indeed impossible; and custom and the lack of a full realization, on the one hand, of the evil results of the veld deterioration and soil erosion caused by present methods and, on the other, of the advantages of the new system.

In order to rectify the present position, many have advocated direct legislation, stringently administered. The Commission states that first and foremost the State is bound to take action in connection with soil erosion which, if persisted in, will lead to national suicide. But the individual also, who has brought the damage, has his responsibilities, and without his co-operation the damage cannot be repaired, for prevention and sustained vigilance are essential, and no State organization can ever supply the minute watchfulness needed. Therefore the Commission does not consider the time ripe for direct legislation; education of public opinion is first required, and thereafter direct legislation if necessary. To awaken the community to its danger sustained propaganda is necessary, particularly that class of instruction natural to the sheep and wool experts of the Department of Agriculture, while instruction on soil conservation should occupy a place in the curriculum of every educational institution in the country.

The Commission finds:—

1. The retention of the old wasteful and destructive method of kraaling and herding small stock is due to several reasons, the chief of which is the presence of the jackal.

2. Other reasons are scarcity of water, want of capital, and the presence of roads.

3. Lack of full realization of the advantages and disadvantages of the two methods of small stock farming also plays an important part.

4. Educative work is now highly necessary to induce the individual to do his share.

5. The State has grave responsibilities in preventing the waste of natural resources; but direct legislation cannot now be recommended.

INDIGENCY ARISING OUT OF DROUGHT LOSSES.

Among the duties of the Commission was that of inquiring into the methods by which indigency arising among the farming community in consequence of drought losses could best be dealt with. The increasing number of indigents drifting to the cities, the Commission finds, is the final picture of a sequence of misfortunes, nor is it due to economic reasons only, but is brought about by such causes as unfit parents, inbreeding, underfeeding, disease, and climatic conditions. Among other reasons for the failure of farmers to retain possession of their land are (*a*) droughts, hailstorms, and excessive frosts; (*b*) jackals; (*c*) stock and plant diseases, and insect pests working separately or in conjunction with droughts; (*d*) cataclysms, such as war, etc.; (*e*) too minute sub-division of farms; (*f*) inflated prices of

ground; (*g*) want of agricultural education and training; (*h*) inability to dispose of farm produce at reasonable rates.

Many of these causes reach their climax through drought. Whatever may be done to mitigate the above causes would result in a reduction of the failures at all times, and the Commission considers that increased facilities for marketing would undoubtedly reduce poverty on farms and that factories for treating perishable produce are desirable. But of fundamental importance is the need for better agricultural education and training; a closer touch with the Department of Agriculture and the technical advice it can furnish is necessary, and in the organization of the farmer is to be found the link that will draw the farmer and the Department together.

The Commission finds:—

1. That the frequent failure of the farmer in South Africa is due to many causes, which so frequently work simultaneously, that it is difficult to separate them. Periods of sudden strain, such as drought or economic cataclysms, accelerate and magnify losses due, in the first place, to other causes.

2. That, if the pressure from any of these causes be reduced, losses due to drought will also be diminished.

3. That organization of the farming community will tend to improve the marketing facilities for all sorts of produce, and will form a link between the Department and the farmer, which will be particularly useful in spreading information.

4. That this will result in increased production and fewer failures among the farming community.

RECOMMENDATIONS.

Having arrived at the above conclusions, founded on the solid support of practical experience corroborated by scientific analysis, the Commission recommends the Government to do its utmost to abolish the kraaling system and make it as easy as possible for the farmer to put the paddock system into practice. To effect this the jackal must be exterminated, provision must be made for the supply of cheap fencing material, and the water supply for stock must be developed. In dealing with these matters, organization of the farmer is the first essential, while the State has to assume certain responsibilities in the control of soil erosion, and the Department of Agriculture has to investigate certain grazing and fodder problems.

ORGANIZATION OF THE FARMING COMMUNITY.

It is in the interests of the State and of the individual to have farmers organized. Organized farmers are easier to deal with, as their wants and desires are more readily ascertained; moreover, the Department of Agriculture is greatly assisted in treating with such organizations, tending to its increased usefulness and at decreased cost than is possible when dealing with individuals. In this manner the knowledge and experience of the expert can be put to more extended use, resulting in a higher standard of agriculture, while the organized farmer becomes more independent and self-reliant. By combining they gain in strength and eliminate the possibility of many

malpractices to which the individual is now subject. Capital for the purpose of manufacturing raw materials is enticed into the country, and local prices are stiffened up; organization, indeed, resulting from the propaganda work carried out by the Commission in the course of its investigations, has already been successful in staying financial panics which would otherwise have resulted in bankruptcy to some.

It is a recommendation of the Commission, therefore, that the Department of Agriculture immediately proceed with the organization of the farming community.

EXTERMINATION OF THE JACKAL.

The train of consequences following the system of farming now in vogue due to the presence of the jackal has been described. The animal is a dangerous menace to the State and must be exterminated. This is necessary in order to enable the adoption of the new system of farming needful to stay the processes that now operate to the detriment of all. To the farmer extermination of the jackal means large savings in the cost of herding his flocks, more and better wool, greater freedom from stock disease and insect pests, greater protection against scab, and an increased capacity of the farm to carry stock. To the whole community it will lead to the recovery of the country's vegetal covering and the staying of soil erosion.

The Commission is of opinion that nothing is more calculated to lead to the ultimate extermination of the jackal than jackal proof fencing, and recommends that the law which now applies to ordinary fencing only, should be amended so as to include jackal fencing in any district where the majority of owners so decides; also that a law be made that will compel three or more farmers to combine for jackal-proof fencing of the boundary of their block farms if the owners of, say, two-thirds of the area or block desire the same. It considers that in regard to hunting clubs the law is not carried out with sufficient stringency with reference to compulsory hunting, and since dogs are bound to play an important part in exterminating the jackal within the fenced areas (and it is the opinion that the jackal should be got rid of by pinning him down to an area which will enable complete eradication rather than by driving him away) the Commission recommends inquiries as to what type or types of dog are best for hunting purposes.

PROVISION OF CHEAP FENCING MATERIAL.

To put into practice the system of paddocking and to erect ordinary and jackal-proof fencing will entail considerable outlay, but the need is so imperative that the Commission recommends that fencing loans be granted by the State to farmers on the best possible terms, and that under such loans farmers be permitted to put up both boundary and paddock fences, whether jackal proof or not, and even to convert an existing stock-proof into a jackal-proof fence; and, generally to utilize fencing for any purpose calculated to improve the drought-resisting capacity of farms. It is pointed out that, among its many advantages, fencing will, by protection during initial growth, lead to the planting of trees on the veld so useful for the shelter and well-being of stock, and will also permit more extensive planting of spineless cactus, a valuable standby in times of drought.

DEVELOPMENT OF WATER SUPPLY FOR STOCK.

Too little attention is given to the adequacy of watering places and to their cleanliness, and stock have generally to be driven long distances to obtain water, the disadvantages of which have already been mentioned. The Commission recommends, therefore, that the State should encourage farmers in every way possible to improve their facilities for watering stock.

THE STATE AND SOIL CONSERVATION.

The culminating result of the system of farming practised all these years has taken a firm hold in many districts where the soil is rapidly being eroded, and even with a general adoption of the paddock system, soil erosion will continue for many years to come. Therefore, while better methods are being put into practice and the danger is gradually being overcome, the Commission recommends, as one of the most important principles, that the State should adopt its responsibilities in connection with the control of soil erosion. As a first step it recommends the immediate appointment of a Reclamation Officer who will be attached to the Department of Agriculture, and be entrusted with the duties pertaining to State control of soil erosion. The first duty of such an officer would be educative, assisting by lecturing, by writing pamphlets, and by personal visits to farms. He would introduce co-operative experiments in controlling erosion, adjudicate in disputes arising out of matters of soil erosion, assist in questions of roads where they affect paddocking, etc.

PROPAGANDA AND INVESTIGATION BY THE DEPARTMENT OF AGRICULTURE.

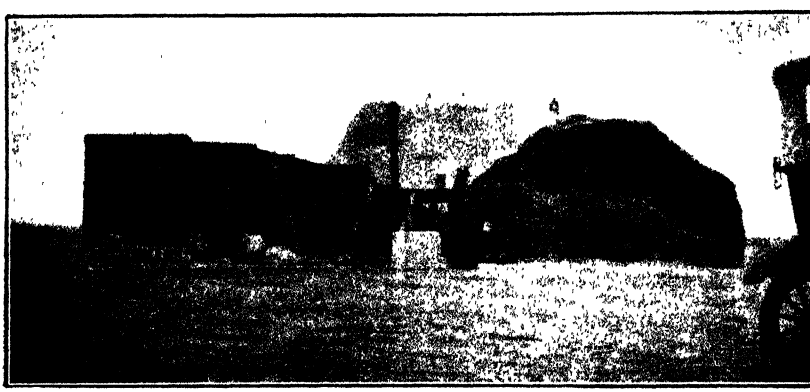
The Commission found that farmers in general were unaware of existing loan facilities for fencing and other purposes, and recommends that the Department of Agriculture take steps to bring this knowledge to the door of every farmhouse in the country, and that a sustained propaganda in favour of a natural life for small stock and against overstocking be undertaken at once.

The many problems connected with the grazing of stock, the Commission recommends, should form the subject of thorough investigation by the Department of Agriculture, for it is only by such investigation that the best methods of management for the various types of veld can be determined. In this connection many farmers told the Commission how valuable they had found prickly pear in times of drought, while experiments carried out at the Grootfontein School of Agriculture have showed that sheep could be kept alive for 260 days on a diet of prickly pear only. This plant is very abundant in many of the drier parts of the Union, but is not generally used, as no cheap, simple method of dealing with the spines with which the "leaves" are covered has yet been evolved. The Commission, therefore, strongly recommends that the Government should investigate the singeing and other methods which are in use in Mexico and Texas with a view to introducing them into South Africa, for, not only is the prickly pear a source of food but also of water. The sheep mentioned above, for example, drank no water during the time of the experiment and four of them, which were subsequently put on

a diet of prickly pear and lucerne hay, were over a year without drinking water, the water requirements of the animals having been fully met by that contained in the prickly pear.

CONCLUSION.

The report outlined above is signed by Messrs. Heinrich S. du Toit (chairman), S. M. Gadd, G. A. Kolbe, Arthur Stead, R. J. van Reenen, and R. A. B. Mussman (secretary). The Commission is still pursuing its investigations. In the meantime it has disclosed a state of affairs that should arrest the attention of every South African, for it calls for immediate action in removing the causes that threaten the extinction of the land which we have received from our forefathers and predecessors, and must deliver to our children and successors. The soil belongs to the nation, not the individual, and its dissipation through erosion is a national calamity that demands the aid of every one to combat it.



[*Photo by G. L. Lance, Onderstedoorns.*

WHEAT GROWING ON THE ZAK RIVER, CAPE PROVINCE.

Photograph showing thrashing operations—steam driven—and in the background a chaff stack of over 52 feet in height, from about 3500 bags of wheat.

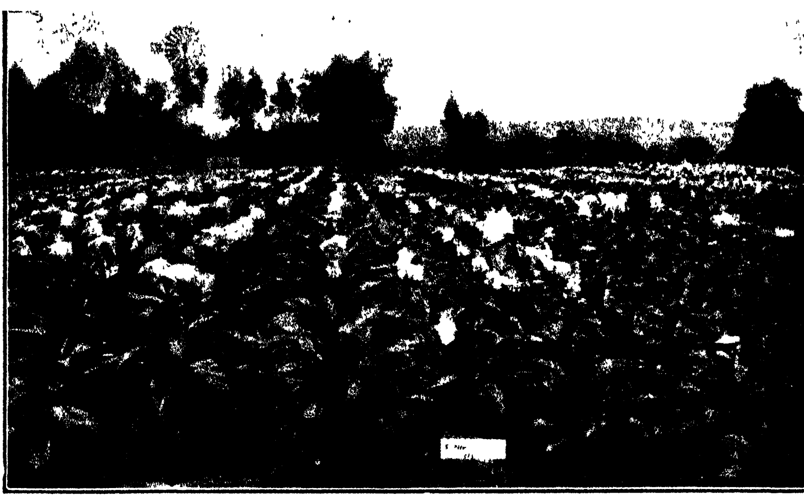
Plant Nurseries in Quarantine as at 1st July, 1922.

Name.	Address.	Cause of Quarantine.	Extent of Quarantine.
A. E. Todd	Pietermaritzburg	Red Scale ..	All citrus.
N. S. van der Merwe...	Wellington ..	Red Scale ...	All citrus.
J. S. Rossouw... ...	Wellington ..	Red Scale ...	All citrus.
C. F. Marais	Wellington ...	Red Scale ...	All citrus.
Badcock & Cunningham	Uitenhage ...	Red Scale ...	Whole Nursery (citrus).
Lovedale Institute ...	Alice	Red Scale ...	Lemon stocks.
F. P. Long	Clumber	Red Scale ...	Whole Nursery (citrus).
S. B. Bartlett... ...	Clumber	Red Scale ...	Whole Nursery (citrus).
F. N. Tarr	Bathurst	Red Scale ...	All citrus.
E. Krohn	Pretoria	Pernicious Scale White Peach Scale Ross Scale	Part Nursery.
D. A. English & Co. ...	Pietermaritzburg	Red Scale ...	Lemon stocks.
R. Mason & Son ...	Pietermaritzburg	Red Scale ...	Lemon stocks.

DIFFERENT METHODS OF CURING TOBACCO.

By J. du P. Oosthuizen, M.Sc. (Agr.), Assistant Chief, Tobacco and Cotton Division, and Manager, Experiment Station, Rustenburg.

At the present time tobacco growers find themselves confronted with an over production, not only of inferior grades of leaf, but also of certain types, such as tobacco suitable for pipe and roll. For a number of years there existed a good demand and, consequently, a ready market for all these types, and even the inferior grades found a quick sale. This demand stimulated production to such an extent



[*Photo by J. du P. O.*

Variety Plots.

that last year approximately 18,000,000 lb. of leaf were produced in the Union. This quantity is considerably more than our local consumption, and naturally affected the demand. In addition to an over production, a large percentage, unfortunately, of that year's crop consisted of inferior or low-grade leaf. This poor quality was partly due to the unfavourable weather conditions experienced during the season and partly to the present methods adopted in the growing, curing, and handling of the crop. Thus, with an over production, and the imposition of an excise duty, there has been no demand for inferior grades, and only a fair demand for the darker types of tobacco. It must be emphasized that there has been an over production not alone of inferior leaf, as has been rather frequently stated recently, but also of the better grades of dark tobacco. The best grades of pipe and roll tobacco in their respective classes, and for their particular

purposes, may be just as good as the best grades of cigarette leaf for its particular use; therefore those types suitable for pipe and roll cannot under any circumstances be considered as inferior or low-grade leaf.

Up to the present we have nearly always found a good demand for leaf suitable for the manufacture of cigarettes; even to-day this demand exists. Soil and climatic conditions affect the quality of leaf very considerably, and in most cases the type of tobacco produced is decided by these two factors. Now, in a number of our larger tobacco-producing districts we have suitable soil and climatic conditions for the production of cigarette leaf, but with the present methods employed during the curing, a very large percentage of the crop becomes unfit for this purpose. Given more attention to the manuring and fertilizing of tobacco lands, suitable varieties, better and more improved methods of curing the leaf, a much higher percentage of this type of leaf could be produced in those districts.

Photo by J du P. O

Field of Piet Retief Swazie.

Further, statistics show that there is a tremendous increase in the world's consumption of cigarettes, consequently an over production of this type of leaf will stand a much better chance of being profitably sold on exportation than in the case of a surplus of dark leaf. It would, therefore, seem advisable to encourage the production of leaf suitable for the manufacture of cigarettes.

By thoroughly understanding the different changes which actually take place in the leaf during the curing process, and carefully studying the different methods of curing tobacco, the grower will be able to produce a better quality of leaf and also a higher percentage of cigarette leaf.

CURING.

The term "curing" implies something more than the mere drying out of the leaf. During the curing process a number of changes take place in the composition and properties of the leaf. These changes are both physiological and chemical.

The chemical changes are brought about by highly complex protein forms called enzymes, the resultant activities of which give changes responsible for the texture, aroma, and colour of the finished product. Yet all these changes can easily be stopped by subjecting the tobacco to unfavourable conditions. For instance, if the ripe leaves are quickly dried out with heat they will become worthless, and will not possess any of the properties characteristic of cured tobacco, or should the tobacco leaves be bruised or subjected to extremely cold temperatures, none of these changes will, nor can, take place. Thus the grower must so regulate the curing of his tobacco that the leaf must go through a process of gradual starvation. When the leaf is thoroughly ripe, it will have accumulated a certain amount of surplus food and will continue to live until all this food is used up. It is during the starvation period, if the conditions under which this takes place are favourable, that a considerable quantity of the starch so accumulated will be broken up into sugars by one

Photo by J. du P. O.

Variety Plots

type of these enzymes called diastase. The protein-content of the leaf and the nitrates also decrease during the curing of the leaf. The former is accomplished by the proteolytic enzymes, and the latter may be due to the reductases. Another notable change during this period is the disappearance of the green colouring matter, chlorophyll.

The tobacco leaf when harvested contains from 70 to 80 per cent. of moisture, most of which is lost during the curing. The rate of drying must be so regulated that this moisture is given off gradually, otherwise the results will not be satisfactory.

The two chief factors which control the rate of curing in such a way as to change the undesirable properties of the green leaf into the desirable forms so much sought after in the cured leaf, are heat and moisture. It is for this reason, if a suitable building is used for curing tobacco where these two factors can be artificially controlled, that such a high percentage of cigarette leaf can be produced.

METHODS OF CURING.

As has been stated above, the conditions of soil and climate affect the quality of leaf to such an extent that in most cases they decide for which purpose the tobacco is to be used, and also determine the method of curing. With our wide differences of soil and climatic conditions thoughout the areas where tobacco is grown, and also the different tastes and demands for the different types of tobacco produced under these varying conditions, four different methods of curing tobacco are in vogue. These are: Air-curing, flue-curing, sun-curing, and fire-curing. The following table shows the largest tobacco-producing districts in the Union, the methods used for curing, the types of tobacco, and the percentage of cigarette leaf produced.

Area.	Production in lb. 1919–20.*	Production in lb. 1920–21.†	Types of Tobacco Produced	Est. Average Percentage of Cigarette Leaf	Method of Curing.
Magaliesberg, including Rustenburg, Krugersdorp, Brits, Groot Marico, and Scheerpoort	5,395,200	8,500,000	Pipe, roll and cigarette	15–18 per cent.	Air-cured
Oudtshoorn	1,836,900	3,000,000	Roll, pipe and cigarette	10–12 „	Do.
Vaal River Area, Vredefort, and Potchefstroom	850,000	1,000,000	Do.	8–10 „	Do.
Piet Retief and Hlatikulu	600,000	800,000	Roll and pipe	5 „	Do.
Stockenstrom	440,000	600,000	Pipe and cigarette	15–20 „	Do.
Western Province: Stellenbosch, Paarl, Ceres, Caledon, Tulbagh	396,900	600,000	Turkish cigarette	100	Sun-cured

The above tabulation is not given for comparative purposes between the air and sun curing methods, as obviously all Turkish tobacco is manufactured into cigarettes, but to give an approximate idea of the percentage of cigarette leaf produced in the Union

AIR-CURING.

This method of curing tobacco will be discussed first, as it is the oldest, and by far the greatest portion of the tobacco crop of the world is air-cured. Practically all the tobacco produced in the Union is so cured. By air-curing is meant the curing of the tobacco without the use of artificial heat, or, in other words, the tobacco is allowed to go through a natural process of curing. There are really two stages to be observed in this method. The first stage commences after the matured leaf is harvested and hung in the shed, and ends at the disappearance of the green colour, which is replaced by a lemon-yellow colour. During this stage of curing it is essential that the rate of drying be so regulated that the leaf will not cure out too quickly nor too slowly. If the leaf is dried out too quickly, it will remain green, be lifeless and chaffy, and practically useless to the trade. On

* Census returns, 1920. † Departmental estimate

the other hand, if the rate of drying is too slow, the curing will be carried too far, which will affect the colour, and may even cause "house-burn." It is during this stage that most of the starches are converted into sugars by diastase. The most favourable temperatures for the first stage of curing, that is the gradual starvation of the leaf, are between 80° and 100° F., with a relative humidity of about 85 per cent.

The most important and noticeable change during the second stage of curing is in the colour of the leaf. In most cases the leaf will lose its yellow colour, and a red or even dark colour will take its place, caused by certain enzymes called oxidases. If the atmosphere is very moist, as is very often experienced during a continuous rainy spell, the leaf will lose its red colour and the tobacco will cure out dark, which will reduce the value of the leaf. If the moisture

Photo by J. du P. O.

Field of South

is excessive, house-burn will follow, further reducing the value of the crop. In order to get the best results, the moisture should be reduced during the second stage of curing and the rate of drying hastened. A careful study of the underlying principles of curing tobacco, as outlined above, explains the varying results obtained in different seasons.

If the season is a very wet one, only a very small percentage of leaf suitable for the manufacture of cigarettes is produced, and if the rains continue for any length of time, the crop is seriously damaged. On the other hand, if the season is very dry, the tobacco just dries out, retaining its original green colour, and is more like hay than tobacco. The grower is at the mercy of the elements. In a good season, a fairly high percentage of bright and light red tobacco is produced in the Transvaal by means of this method, but, unfortunately, ideal seasons for curing do not come very often. The result is that every year the grower suffers serious damage and great

loss financially in being unable to maintain proper conditions during the curing of his crop.

By making use of heat and moisture, some of these losses can be avoided, even where the tobacco is air-cured. A great percentage of the cigarette leaf which turns dark can be saved by building small charcoal or coke fires, at the critical stage of curing, in the barn below the tobacco during a long wet spell. The heat will have the effect of drying off the surplus moisture, which will prevent the curing from going too far with an excess of moisture, and will thus save the colour and, moreover, will reduce the dangers of house-burn. In a favourable season proper ventilation without these fires will have the desired effect. Here the moisture evaporating from the surface of the leaves will saturate the air in the shed, but by ventilation the moist air is removed owing to the circulation of air. During wet

[*Photo by J. du P. O.*

Tobacco Field showing seedheads covered with paper bags.

weather the air will become saturated in the shed and outside, and ventilation alone will not be sufficiently effective. The beneficial use of the artificial heat is now apparent. By raising the temperature in the barn by 20° F., the moisture-holding capacity of the shed is doubled, and by keeping the temperature inside the shed about 20° F. higher than outside, together with just sufficient ventilation, the elements can be controlled and the curing of the barn will be successful.

Again, in a very dry season, moisture, which will prevent the leaf from drying out too quickly, should be applied on the floors of the sheds during the first stages of curing. Then the leaf will not simply dry out into a green colour, but will be properly cured. The green colour will be changed into a lemon-yellow colour, which may be fixed or may cure into a light red or red, depending on how the moisture is drawn off.

Different Kinds of Sheds Used in Air-curing.--There are three different types of sheds in use in the Union. Each type is named after the kind of material used in building, e.g. brick, corrugated iron, and grass sheds. These sheds are usually cheaply and simply constructed, and are certainly not as elaborate as the air-curing sheds found in the Burley section of Kentucky. The results obtained in these three different sheds over a period of five years are given below. It will be seen that, if anything, there is a slight advantage in favour of the grass shed. At the same time it must be pointed out that, in wet weather, the tobacco will be apt to cure out a dark colour in the grass shed. In very dry weather the tobacco generally cures out too rapidly in the corrugated iron shed, and the leaf retains too much of the green colour. In a wet season the corrugated iron shed usually gives better results, as no surplus moisture is absorbed by the roof.

Photo by J. du P. O.

Nicotiana rustica and Piet Retief Swazie

Thus, when the weather becomes more favourable, the rate of drying out, which is very essential after or during such a spell, is faster than in the grass shed.

On certain types of soil the tobacco yellows on the land, as, for instance, the turf soils in the Rustenburg District. Tobacco from these soils will usually cure out a better colour in the corrugated iron shed than in the grass shed, as in this case the curing must not be delayed but hastened.

The results from the brick barn were very good in favourable seasons. If this barn was smaller, so that the whole barn could be filled in one or two days, much better results would have been obtained by proper ventilation, and during a wet spell the use of artificial heat would help tremendously.

Year.	Shed.	Percentage Bottom Leaf.	Percentage Dark Leaf.	Percentage Cigarette Leaf.
1916 1917	Brick	18·3	3·7	72·9
	Iron	15·8	14·3	69·8
	Grass	14·3	8·7	76·9
1917 1918	Brick	19·8	45·4	34·0
	Iron	19·5	55·5	25·0
	Grass	17·4	44·3	38·0
1918 1919	Brick	24·6	24·3	51·0
	Iron	13·0	58·4	28·4
	Grass	22·1	35·1	42·7
1919-1920	Brick	22·8	36·4	40·8
	Iron	13·0	31·0	56·0
	Grass	13·5	30·9	55·6
1920 1921	Brick	15·7	71·9	12·4
	Iron	23·4	60·1	16·5
	Grass	14·7	75·3	10·0

For air-curing, Joiner, Sterling, Yellow Pryor, and Piet Retief Swazie are to be recommended. Tennessee Red also gives a high percentage of cigarette leaf, but it has a very thick midrib which, in a wet season, retains some of its original sap, and when packed in bulk will cause the bulk to go mouldy. The following table gives the percentages of cigarette leaf obtained from six varieties over a period of three years: —

Variety.	1918-1919.	1919 1920.	1920 1921.	Average for Three Years
Joiner	54·1	60·0	14·7	42·93
Sterling...	47·7	52·0	10·6	36·76
Tennessee Red	49·7	58·8	15·8	41·43
Yellow Pryor	40·5	61·2	5·0	35·56
Bullion	21·8	28·0	9·0	19·60
Improved Clarksville ...	28·2	36·2	12·3	25·56

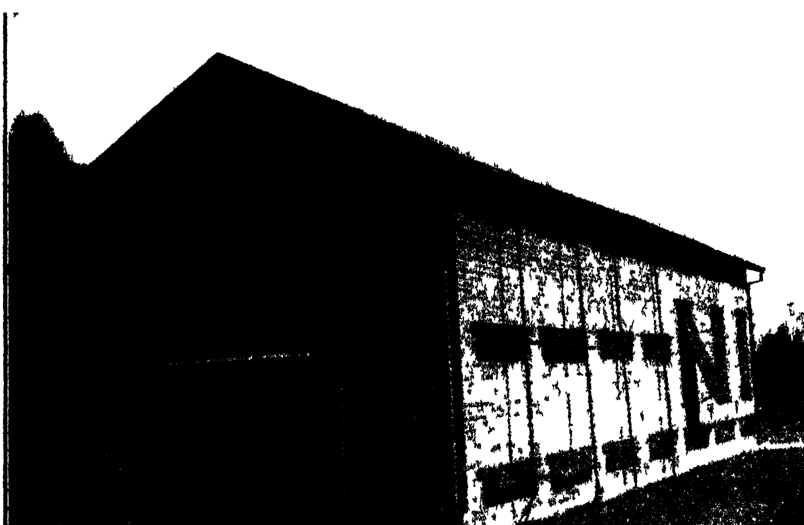
The method of harvesting tobacco also influences the rate of curing and, consequently, the percentage of cigarette leaf obtained. The three different methods practised are whole-stalk, split-stalk, and priming or picking the individual leaves. For air-curing, the first method is commonly practised in the Union. The following table gives the results obtained at the Rustenburg Experiment Station for two seasons: —

Method.	Season.	Total Weight.	Percentage Cigarette Leaf.
Split-stalk	1918 1919	492 lb.	41·68
Whole-stalk	1918-1919	471 „	46·49
Primed	1918 1919	302 „	51·49
Split-stalk	1919 1920	128 „	40·1
Whole-stalk	1919-1920	134 „	63·1
Primed	1919-1920	156 „	71·1
Split-stalk	1921 1922	69 „	30·4
Whole-stalk	1921 1922	49 „	69·3
Primed	1921 1922	49 „	89·7

SUN-CURING.

This method of curing has been practised in a few counties in Virginia, and the type of tobacco produced is known as "Virginia sun-cured." There is not a great deal of difference between sun-curing and air-curing. In neither system is artificial heat used to hasten the curing. In the Union all the Turkish tobacco is sun-cured, although the system adopted here is slightly different from the one in Virginia.

Formerly the tobacco known as Virginia sun-cured was exposed to the sun for several days immediately after harvesting, and when the leaf had reached the proper stage of curing, it was taken to a barn more or less similar to the air-curing sheds used in the Burley section of Kentucky, in which the curing was completed without the use of artificial heat. When the tobacco was harvested, the plants were



[Photo by J du P O

Brick Shed

hung on sticks which were placed rather closely together on the scaffolds in the open for a period of from three to four days. As soon as the proper stage of yellowing was reached, the sticks of tobacco were moved farther apart for a day or so, then removed to the barn, where curing was completed. The barns were so ventilated that they could be closed during wet weather, or at night-time, and opened during dry weather or day-time. These scaffolds were usually built close to the barns so that the tobacco could be easily moved into the shed during rainy weather. Although this method is still practised by some growers in the sun-cured belt, air-curing as described above is the more common method at the present time.

The method of sun-curing Turkish tobacco in the Western Province is slightly different. In the first place, the leaves are primed (picked separately) as they mature from the bottom upwards. The

leaves are then strung on reeds by means of long steel needles, and the string containing the leaves is tied on to the reeds at several intervals to prevent sagging. The reeds of tobacco are then hung in a wilting room until the leaf assumes the proper yellow colour, taking from two to four days. It is very essential to have the right amount of moisture in the barn in order to get the best results. The relative humidity must be about 85 per cent. The hygrometer is used for this purpose, and the difference between the dry and wet bulbs should be 3.5 degrees. If more moisture is needed, wet grass can be placed on the floors, the walls sprayed with water, or the wilting room can be opened during nights and closed during day-time.

As soon as the tobacco has yellowed properly in the wilting room, it is removed to the drying camp, where it is hung in scaffolds exposed to the sun and open air. For the first day or two during very hot weather the leaf should be covered by means of hessian or grass,

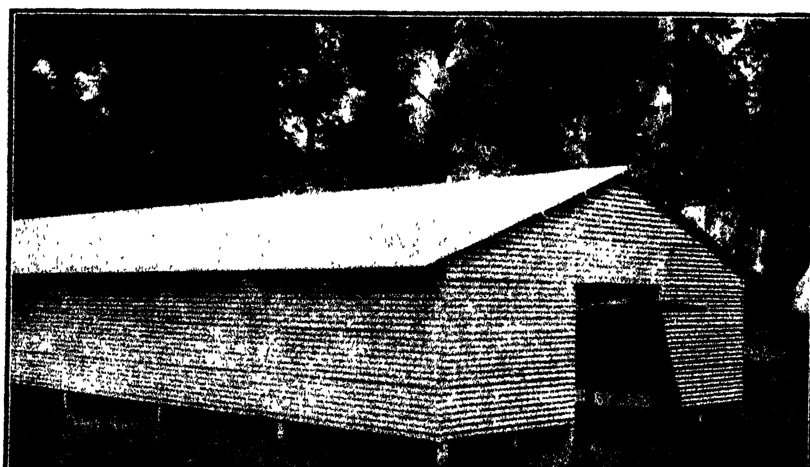


Photo by J. du P. O.

Corrugated Iron Shed.

after which the covering is removed, and the leaf left until it is thoroughly cured. During rainy weather the tobacco must be covered. When thoroughly cured the tobacco is brought into case and bulked.

Sun-curing improves the flavour and aroma of tobacco. The Virginian sun-cured tobacco is chiefly used for chewing, and the Turkish sun-cured for the manufacture of cigarettes.

FIRE-CURING.

This method of curing is practised almost exclusively in Western Kentucky, Tennessee, and Central Virginia. It differs from the two previous methods in that artificial heat is used during the process. Small open fires are built of logs beneath the tobacco on the floor of the barn. The smoke from these fires gives the tobacco a peculiar and distinctive aroma. As this type of tobacco is mostly produced on a

heavy soil, containing a high percentage of clay, it usually cures out a dark colour, although most growers attempt to get a good, rich cherry-red colour. The cured leaf has good body and is heavy. Most of this type is exported to Germany, England, Spain, Italy, and Austria.

The tobacco plant must be topped low so as to force the growth of the remaining leaves, causing all the leaves to grow larger and thicker, and the tobacco will take on a dark colour on the land.

The chief varieties grown for fire-curing are the Pryors, Yellow Mammoth, and the Orinocos.

The barn or shed used for fire-curing is usually about twenty feet square. They were first built of logs, but recently they have been replaced by more up-to-date frame buildings of fairly large size. For the first few days after the sheds are filled no artificial heat is used. If the atmosphere is dry, the tobacco should be crowded closely together during the first period of curing. On the other hand, if the

[*Photo by J. du P. O.*

Grass Shed.

weather is cool and damp, crowding the tobacco is not to be recommended. Building a few small fires in the barn to maintain the temperatures at from 85° to 90° F. would help materially to bring about the colour changes.

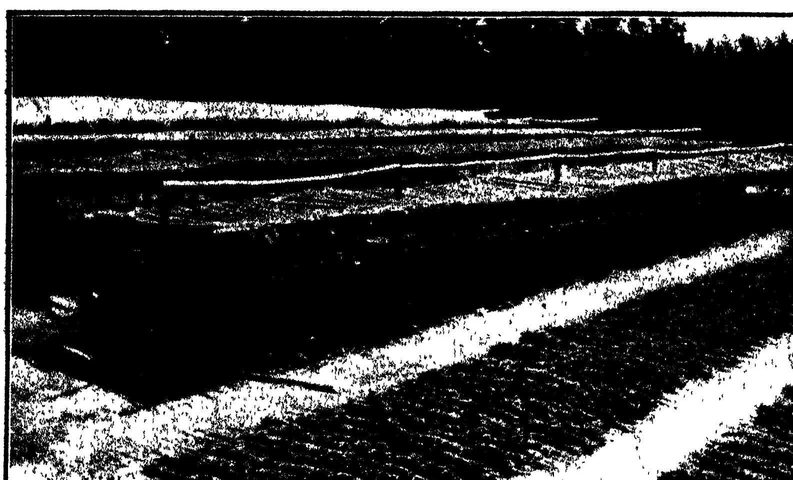
As soon as the tobacco has taken on the proper yellow colour, a number of small open fires are built at various places on the floor of the barn, and the temperature gradually increased and maintained at about 95° F. until the tips of the leaf begin to turn a brown colour or dry. Too much heat at this stage of curing will scald the tobacco, thus reducing the value. The fires are increased and the temperature gradually raised to 125° F. It is very seldom necessary to keep the fires going for longer than from four to five days.

This method of curing tobacco has also changed somewhat. Formerly it was the custom to stop the fires after the surplus moisture was driven off, and as soon as the leaf began to dry. When the barn

was cool the sap from the stems and midribs became uniformly distributed throughout the leaf, and after a few days the fires were restarted, and this practice of stopping and restarting the fire was repeated until the leaf was thoroughly cured.

FLUE-CURING.

As in fire-curing, artificial heat is also used in this method. Instead of open fires, however, the artificial heat is distributed in the barn by means of flues or large pipes which also carry off all the fuel gases, so that the smoke cannot come in contact with the tobacco. Log or wood fires are built in one or two fairly large furnaces, built in the wall of the barn, and extending both to the outside and inside of the barn. The heat generated passes through the system of flues placed in the barn.



[*Photo by P. Koch*

Sun-curing Turkish Tobacco

This type of tobacco is produced on a large scale in the eastern districts of South Carolina, in the northern and eastern districts of North Carolina, and in Southern Virginia. This method of curing has recently been introduced into Georgia, where it has met with great success. In South Africa practically all the flue-cured tobacco is produced in Rhodesia. In the Union the tobacco farmers have not yet taken to this system of curing their leaf, although from results obtained at the Rustenburg Tobacco and Cotton Experiment Station as far back as 1911, it was clearly shown that it can be done successfully in that district. Below is given the results of three barns cured during the present season. The tobacco was grown on norite turf, and the total acreage from which the tobacco was picked consisted of just under one acre of Joiner and one acre of Sterling.

Variety.	Weight Bottoms.	Weight Dark Leaf.	Weight Cigarette Leaf.	Total Weight	Percentage Cigarette Leaf.
Joiner ..	16	66	408	490	83·2 per cent.
Sterling ..	7	91	378	469	80·6 „
Joiner ..	1	62	533	595	89·6 „

In curing tobacco by this method, the chief aim of the grower is to obtain a yellow colour, which, generally speaking, controls the value of the leaf so cured. There are several conditions necessary for the successful curing. The principal of these are:—(1) The right type of soil, and (2) proper management of the curing.

In addition to these, careful attention must also be given to the kind and quality of manure or fertilizer applied to the land, and

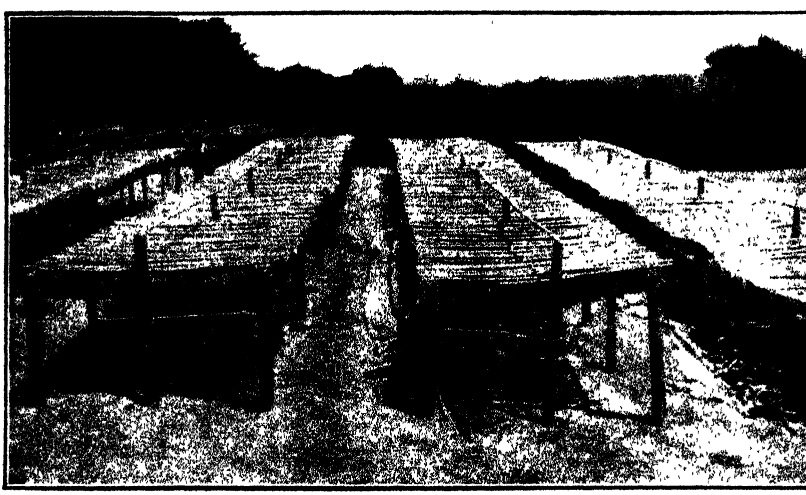


Photo by P. Koch.

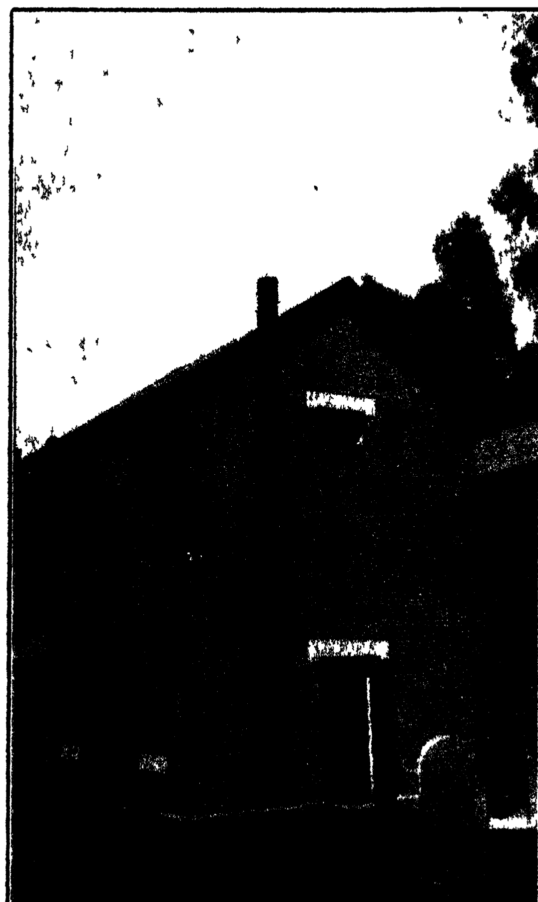
Sun-curing Turkish Tobac

harvesting the tobacco at the proper stage of ripeness; moreover, the acreage of tobacco must be large enough to provide sufficient leaf of more or less the same texture and ripeness for filling each barn.

The most typical soils are light sandy soils and sandy loams with subsoils containing small proportions of clay. Norite turf, which is distinctly clayey, is an exception. This type of soil, although black and clayey, also gives good colour under air-curing conditions. The varieties found most suitable for flue-curing in the States are the different strains of Orinocos such as Big Orinoco, Little Orinoco, Gooch, and the Pryor group such as Yellow Pryor. In Rhodesia, Goldfinder, South, and Hester give good results, while at the Experiment Station, Rustenburg, Joiner, South, and Yellow Pryor have proved very suitable.

There are two ways of harvesting tobacco for flue-curing. The first system consists of splitting the stalk from the apex, cutting it

off a few inches below the split, and laying it astride a lath. In the other method the leaves are picked as fast as they ripen. The bottom leaves will ripen before the others, and these are picked first. Generally from three to four leaves are removed from each plant at each picking. The leaves are taken to the barn, where they are tied on to the sticks, by means of twine, in bunches of from three to five leaves, alternately on opposite sides until the stick is full.



[*Photo by J. du P. O.*

Flue-curing Barn

It is very important that the tobacco should be thoroughly ripe at the time of harvesting. Such tobacco is usually very rich in starch, but lacks colouring matter, due to the nature of the soil selected for the production of this type. Hence the tobacco usually takes on a yellowish colour on the land. If the soil were too heavily fertilized with a nitrogenous fertilizer, the tobacco would have a dark green appearance on the land, and it would be almost impossible to cure it into a lemon-yellow colour.

In flue-curing the aim of the grower must be to hasten the yellowing of the leaf under conditions so favourable that all the desirable changes in the leaf will take place in as short a time as possible. But when all these necessary changes have occurred, and the leaf has taken on the proper yellow colour, the curing must be so regulated that the second stage in air-curing, that is, when the leaf begins to dry, the red colour must be prevented.

The barns used in flue-curing are generally small. The inside dimensions are from 16 to 24 feet square, and from 16 to 20 feet in height.

No definite formula can be given for flue-curing, as so much depends on the type of tobacco grown, the nature of the soils on which they are grown, and the prevailing weather conditions during the curing of the tobacco. The most important factors in controlling the rate of curing are heat and moisture, and with these of course ventilation, and in order to cure a barn successfully these factors must be so regulated that the leaf can take on its proper yellow colour, after which the colour must be fixed so that no further change in colour can take place.

It should not be very difficult to flue-cure a barn successfully if the different stages which are to be observed in this method of curing tobacco are carefully explained. If the whole plant is harvested, there are four such stages, namely: (1) yellowing; (2) fixing the colour; (3) drying the leaf; and (4) drying the stalk.

If only the leaf is harvested, then only the first three stages are to be reckoned with. Although the split-stalk method of harvesting tobacco is still preferred in the western portion of the flue-curing belt in the States, the general tendency is to harvest the individual leaves as they ripen.

Yellowing.—It is very essential to have the barn filled in one day, otherwise the tobacco may not all yellow at the same time. As soon as the barn is filled with tobacco, a thermometer and an hygrometer are hung on the lower tier near the centre of the barn, and the door and ventilators closed. A small fire is then started in the furnace.

The fire must be gradually increased, as it is essential to maintain a moderate temperature during the yellowing of the leaf. During this stage of curing the temperature must not be allowed to exceed 120° F., for at that temperature the leaf is quickly killed, and no further change in the colour or properties of the leaf can take place. It usually takes from 30 to 48 hours before the leaf is properly yellow. It is therefore advisable to raise the temperature gradually up to 90° F., where it is kept until the tips and edges of the leaf show signs of yellowing. The fire is again increased until the thermometer registers 95° F., where the temperature is maintained until the green colour disappears and the leaf takes on a pronounced yellow colour. From 9 to 12 hours after the fire is started the hygrometer will begin to show its utility by indicating that there is not sufficient moisture in the barn for successful curing. If no artificial moisture is supplied, the tobacco will dry out a green colour. If the moisture is insufficient, the difference in temperature between the dry and wet bulbs of the hygrometer will be more than four degrees. Artificial moisture must at once be furnished. Water is usually sprayed on the floor and walls below the tobacco, and sometimes wet bags are placed over the flues.

Sometimes the tobacco hanging immediately above these wet bags cures out more of a red than of a yellow colour. The reason is that when the wet sack is placed on the hot flues, too much steam is evaporated which on condensing cause drops to form on the leaf immediately above them. For this reason it is far more satisfactory to place straw or grass on the floor of the barn, and to wet it just sufficiently to have the right amount of moisture in the barn. If the difference between the wet and dry bulbs of the hygrometer could be maintained at 3.5 degrees, the yellow colour would develop much more rapidly. As the temperature is increased, moisture will have to be added more frequently.

Although the yellowing of the leaf will continue until the temperature is raised to 120° F., it is preferable to have a distinctly yellow colour before the thermometer registers more than 100° F. The value of the crop is often reduced by those growers who fail to get rid of the green colour before fixing the colour. As soon as the original green colour has disappeared the temperature is raised to about 110° F., and when the proper yellow colour has developed the temperature is increased to 115° or 120° F. From 100° F. the moisture must be gradually reduced in the barn. For every 5 degrees the temperature is raised above 100 degrees the difference registered between the dry and wet bulbs of the hygrometer may be allowed to increase about 2 degrees, so that when the temperature stands at 115° F. there will be a depression of about 10 degrees, or if it is taken up to 120° F. the difference will be about 12 degrees.

Fixing the Colour.—This is the second stage of curing, commonly referred to as the critical period. It commences as soon as the leaf is properly yellow. The first aim of the grower now must be to remove the moisture as fast as it is given off by the leaf, and under no circumstances must moisture be allowed to collect on the leaf. The ventilators are consequently opened just enough to remove this moisture. If the moisture is allowed to collect on the surface of the leaves, there will soon be a change in the colour to red or brown. On the other hand, if the tobacco is killed too quickly by raising the temperature before most of the moisture in the leaf has been removed, the tobacco will scald, that is, it will turn a greenish black colour.

In order to get the best results the barn must be ventilated as described above, and the temperature must be gradually raised until the thermometer registers 130° F. When the ventilators are first opened it is advisable to keep the temperature at 115° or 120° F. for a while. The fire must be increased as the ventilation is increased, so as to keep the temperature in the barn constant. As soon as the tips dry, that is, when they begin to cure, the temperature is increased to 125° F., and held until the lower portion of the leaf is dry, when it is increased to 130° F. until the web of the leaf appears to be dry. The colour will now be fixed.

Drying the Leaf.—The leaf must then be dried thoroughly. The temperature is raised to 135° F., and held for a few hours, when it is again increased to 140° F., and kept until the leaf is thoroughly dried out. As most of the moisture is removed from the tobacco the ventilators should be nearly closed, and the temperature increased to about 165° F., which should be raised at the rate of 5 degrees an hour. This temperature is maintained until the midribs are properly dried out.

Drying the Stalk.—The next step is to dry out the stalks thoroughly, and in order to do this the temperature is raised to 175° or 180° F., and kept there for a further period of about 12 hours, when the stalks should be completely dried out.

It takes anywhere from four to six days to flue-cure a barn of tobacco. The time required for curing each barn will depend chiefly on the type of leaf to be cured and how soon it yellows, and on the temperature of the atmosphere outside the barn, which also influences the rate of curing. During wet or warm weather higher temperatures will be required than during dry or cool weather.

It will perhaps be useful to give a record of the temperatures (as shown below) kept during the curing of barn No. 3, mentioned above. As the atmosphere and other conditions will vary for each barn cured, these temperatures can only serve as a guide, and will have to be altered to meet the special conditions under which the curing takes place.

PREPARING THE LEAF FOR MARKET.

No matter how well a crop of tobacco is grown and how successfully it is cured, the value of it can be reduced very considerably, and in some cases become practically worthless, through bad management after curing. On the other hand, if the crop receives the necessary attention during curing, and is graded properly and baled, the value is still further enhanced. The tobacco crop requires skilful handling from the time it is harvested up to the time it is offered for sale. Most farm crops can be sold as soon as harvested without much additional labour and expense. It is for this reason that the tobacco grower should be entitled to a bigger margin of profit than the grower of any other farm crop.

After the tobacco is cured the grower must bring his leaf into case, i.e. into condition, so that the leaf can be handled without breaking. Steam can be used for bringing the leaf into case, but if not available a conditioning cellar is used for this purpose. This cellar is made in the ground below the shed or near by so that the tobacco can easily be removed from the shed to the cellar. The tobacco must not be allowed to absorb too much moisture, otherwise it will be in too high a condition, and if packed in bulk, after grading, will be liable to heat or become mouldy. Consequently the bulks must be watched, and as soon as they begin to heat the tobacco must be rebulked.

When the tobacco is in proper condition for handling, the leaf is graded into the different grades of bright, red, and dark, and separate grades are also made for the tips and bottoms. Colour and length of leaf must be taken into consideration when it is graded. As soon as the leaf is properly graded it is stacked in bulks. The bulks must be about six feet wide and about the same height, the height of each bulk depending on the quantity of leaf to be stocked and on the space available for this purpose. Each grade is bulked separately, and care must be taken not to bulk the tobacco in too high condition. The bright grades must contain just sufficient moisture not to break when bulked. The dark leaf can stand slightly more moisture than the bright leaf. The bulks must be weighted down, otherwise the leaf will dry out too much. If the tobacco contains just sufficient moisture, the curing of the leaf will continue in the bulk and the leaf will take on a more even colour, losing all the original green colour, and the

Date.	Hour.	Thermometer.		Hygrometer.		Cent.	Signed.	Remarks.
		Max	Min	Dry.	Wet.			
31st	5 p.m.	130	132			54	G L. and S.W.	Clear and calm.
,,	6 p.m.	133	134			55	,,	,,
,,	7 p.m.	133·5	135			56	K.P.J.v.H.	,,
,,	8 p.m.	133	135			56	,,	,,
,,	9 p.m.	134	135			56	,,	,,
,,	10 p.m.	133	135			56	,,	,,
,,	11 p.m.	133	135			56	,,	,,
,,	12 p.m.	134	136			56	,,	,,
1st	1 a.m.	138	140			57	,,	,,
,,	2 a.m.	144	145			59	,,	,,
,,	3 a.m.	147	149			61	,,	Closed bott. vent.
,,	4 a.m.	153	155			63	,,	Clear and calm.
,,	5 a.m.	158	160			70	,,	Reduce top vent.
,,	6 a.m.	158	160			71	,,	Calm and clear.
,,	7 a.m.	158	160			71	P.K.A.H.	,,
,,	8 a.m.	158	160			71	,,	,,
,,	9 a.m.	158	160			71	,,	,,
,,	10 a.m.	159	161			71·5	,,	Clear, slight breeze.
,,	11 a.m.	158·5	160·5			71·5	,,	,,
,,	12 a.m.	158	160			71·7	,,	,,
,,	1 p.m	157	159			70·5	,,	,,
,,	2 p.m.	158	160			71	E.S.du P.	Windy and clear.
,,	3 p.m.	158·5	160·5			71	,,	,,
,,	4 p.m.	157·5	159·5			70·5	,,	,,
,,	5 p.m.	158	160			71	,,	,,
,,	6 p.m	158	160			71	,,	,,
,,	7 p.m.	158	160			70	,,	,,
,,	8 p.m.	163	165			72	P.K.v.N.	Clear and calm.
,,	9 p.m.	163	165			72	,,	,,
,,	10 p.m.	163·5	165·5			72	,,	,,
,,	11 p.m.	164	166			73	,,	,,
,,	12 p.m.	163	165			72	,,	Clear, slight breeze.
2nd	1 a.m.	163·5	165·5			72	,,	,,
,,	2 a.m.	163	165			72	,,	,,
,,	3 a.m	164	166			72	,,	,,
,,	4 a.m.	163	165			73	,,	,,
,,	5 a.m	163	165			73	,,	,,
,,	6 a.m.	163	165			73	,,	,,
,,	7 a.m.	162·5	164			74	K.P. and J.v.H	,,
,,	8 a.m.	164	165			76	,,	Windy and cloudy.
,,	9 a.m	167	169			78	,,	Windy, but clear.
,,	10 a.m.	164	165			77	,,	,,
,,	11 a.m.	167	169			77	,,	Windy and cloudy.
,,	12 a m	169	170			77	,,	Slight breeze, cloudy.

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A POTENTIAL WEED.

ARAUJIA SERICIFERA, BROT.

By E. P. PHILLIPS, M.A., D.Sc., F.L.S., Division of Botany, Pretoria.

IN 1903 Mr. J. Burtt-Davy, then the Government Botanist, drew attention to a creeper which was reported as becoming a great nuisance in some Johannesburg gardens. Since then apparently nothing has been written on the spread of this plant in South Africa.

The genus *Araujia* occurs in Brazil where it is represented by about ten species of which *A. sericifera*, Brot., appears to be the best known, having been introduced into many countries as an ornamental plant. This species is known to seedsmen under the names of *Araujia albens* and *Physianthus albens*, and popularly known as the Moth Catcher or Cruel Plant.

Kerner (*Natal History of Plants*) mentions that "in its own country it (*Araujia sericifera*) is visited by humble bees . . . . in other localities its sweet smelling tubular flowers are visited by hosts of moths which are apparently unacquainted with the mechanism of the pollen masses, etc., and get trapped by their probosces in the slit-like notches which are present between the anther wings."

The plant, which is a climber, belongs to the natural order *Asclepiadaceae* (represented in South Africa by several melkbossies, carrion flowers, etc.). All parts of the plant exude a milky juice when cut. The leaves are opposite, stalked, 2-3 inches long, and about 1-1½ inches broad at the base; they are more or less oblong in outline, square at the base, and ending in a pointed apex, quite devoid of hairs, dark green above, and a paler green beneath. The flowers which are borne in the axils of the leaves are a creamy white and sweet smelling. The seed pod is a large green egg-shaped fleshy body up to 6 inches long, and over 2 inches in diameter at the base, with a deep grove on one side. The seeds, which are about $^1/_5$ inch long, end in a long tuft of silky hairs. When the fruit is ripe it splits down one side, and the seeds may be carried by the wind long distances from the parent plant.

There is no record as to when this plant was first introduced into South Africa, but from reports received from time to time by the Division of Botany, it has undoubtedly spread over most of the Union, and has also been recorded from Swaziland.

The plant is a very prolific seeder, and as the seeds are so well adapted for wind distribution, it is no wonder that it is spreading so rapidly. As the plant is a climber there appears to be little danger of it invading the natural veld, but there is every possibility of it becoming a nuisance in plantations, and it certainly is a nuisance in gardens. The writer has seen poplar trees in Pretoria covered with *Araujia sericifera*, and if it is allowed to grow unchecked will probably smother them.

This article is merely to sound a note of warning as to the potential danger of the plant as a weed. It certainly should not be deliberately cultivated as an ornamental plant, and where plants are growing it will be advisable to destroy them.

Readers who know this plant in their areas, are requested to forward specimens O.H.M.S. to The Chief, Division of Botany, Box 994, Pretoria, so that the present area of distribution may be carefully mapped for future reference.

Araujia sericifera, Brot.

IRRIGATION—ITS RELATION TO CROP YIELDS, SOIL, AND "BRAK" (ALKALI).

BY H. W. TURPIN, B.A., M.Sc., Ph.D., Lecturer on Crops, Grootfontein School of Agriculture and Experiment Station, Middelburg, Cape.

BY irrigation is understood the artificial application of water in order to ensure steady and profitable yields where the natural precipitation is deficient in total quantity or is unfavourably distributed.

The Need for Irrigation.—If we study the rainfall of the world, it will be noted that about 25 per cent. of the earth's surface has an average precipitation of less than 10 inches, while some 30 per cent. receives from 10 to 20 inches. In other words, about 6-10ths of the earth's surface has less than 20 inches of rainfall. In the classification of areas according to the precipitation, those receiving less than 10 inches are said to be "arid," while the parts getting 10 to 20 inches are spoken of as "semi-arid." It is in the arid and semi-arid regions that irrigation is primarily required, although there are some humid areas whose yields may be improved by the application of water on account of the unfavourable distribution of the rain.

Water Requirements of Crops.—The question may be asked why it is that an area having an average annual precipitation of, say, 10 to 20 inches requires the artificial application of water in order to produce *annually* a profitable crop. The answer is simply this: On an average a crop, say, of mealies requires about 600 lb. of water to be transpired (passed out through the leaves) for every pound of dry matter produced. Now, of the rain that falls on any particular piece of land, a certain amount is lost by evaporation, some by "run off," some by percolation through the soil, and what remains in, or is retained by, the soil alone is useful to the crop in the production of dry matter. We may safely assume, for experiments have proved it, that under certain conditions 50 per cent. to 60 per cent. of the rainfall is lost in one or the other of the ways mentioned above, so that out of a 15-inch rainfall we can only reckon on about 6 inches or less on which to mature a crop. (The principles of dry farming make for the retention in the soil of the greatest quantity of two seasons' rainfall for the use of one crop. In other words, the soil becomes the reservoir of the dry farmer, just as dams are the reservoirs of the irrigation farmer.) The equivalent of 6 inches in terms of tons of water per acre is roughly 680 tons, which is a quantity of water just about sufficient to give approximately one ton of dry matter per acre. In the case of the mealie crop, this will mean about 5 bags of grain and 12 cwt. of stover per acre, which can scarcely be regarded as a paying proposition, seeing that it will cost around £2 per acre to produce this crop. This illustration shows why, in arid and semi-arid regions, it is necessary to supplement the natural precipitation with artificially applied water. It has been estimated that, when all

irrigation schemes have been perfected, only 1-10th to 1-5th of the arid and semi-arid lands will be under irrigation, showing that it is not the available surface of land that will restrict the further extension of irrigation, but the lack of water itself. This means that every effort should be made to obtain the biggest possible yield per unit of water used. This point will be referred to later. Since so large an amount of the earth's surface can never be brought under irrigation, it will remain for the dry farmer where possible to render productive the rest of the arid and semi-arid lands.

Irrigation and Dry Farming.—Irrigation and dry farming must go hand in hand in bringing the thirsty desert lands to productivity, for by applying the principles of dry farming to irrigation practice the biggest total yield per unit of water will be obtained and the best and safest utilization of the available water supply will be made.

Plant Growth and Irrigation.—There are some five essential factors in the growth of plants, namely, oxygen (from air), water, food, temperature, and light. There must, of course, also be no injurious or harmful substances. In order to get the best response to irrigation water, it is necessary always to study the factors given above. Perhaps some of us have wondered at the marvellous response of our crops and the veld to a shower of rain, whereas a similar quantity of water applied artificially in the normal way may result in hardly any response at all. The words of the late Professor F. H. King will be read with interest in this connection. He says: "The ideal application of water to a field is realized completely in the gentle, continuous rain which falls at just the rate which permits each drop to enter the soil where it falls without ever saturating completely any portion of the root zone above its capillary capacity, but carrying all parts of it up to that limit. If any method of applying water to the field is devised which can approach this ideal in all its effects upon the soil, a vast increase in yield will be possible and a large increase in the duty of water will be secured. With such a method of distributing water expeditiously and economically, many more acres of land in the arid regions could be reclaimed and most of the losses from seepage and alkalis would be avoided." The reason then why the rainfall results in such a response would seem to lie in the fact that the soil does not become saturated, which means that the air (containing oxygen) is not all driven out of the soil, thereby depriving the roots for a time of one of the essential factors in their growth. The rain also contains, as a rule, a larger quantity of oxygen dissolved in it than does irrigation water. This oxygen will help to take the place of that driven out of the soil by the water. Another explanation is found in the effect of a large quantity of water applied at one time to the surface of the soil.

EFFECT OF WATER ON THE SOIL.

(*a*) On the size of the soil particles: Soils formed under arid and semi-arid conditions are largely only slightly altered rock-powder containing varying quantities of organic material. When irrigation waters are led on to such soils certain changes take place, due largely, to the action of water and carbon-dioxide on the feldspars. As a result, the particles become partly

broken down into clay (hydrated aluminium silicate), lime, and sodium carbonate (especially where the soils are of doleritic origin). The action of irrigation water is partly then to fine down the soil, making it more clayey, and frequently to cause the production of carbonate of soda, a substance that tends to deflocculate the soil granules, making the soil more or less impervious to both air and water.

(*b*) On soil granules or aggregates of soil particles: A normal soil has its particles aggregated into little crumbs composed of fine and coarse particles. These crumbs are porous, and capable of holding a large amount of water in the capillary (useful to plants) state. When water is allowed to stand on such granulated soils, the tendency is for the crumbs to break down into separate particles, so that when the water dries up the soil no longer has its desirable crumb structure and, as a result, tends to become cloddy and difficult to work. This condition will be made worse if sodium carbonate be present, for this substance also tends to break down the crumbs. It will be noticed, then, that the application of a large quantity of water tends to bring about a condition of the soil in which the soil particles become more closely packed together, not in aggregates or crumbs, but as individuals. The soil having the granular or crumb structure will have more space (pore space) than the soil in which the particles function as individuals, for in the former not only is there space between the crumbs, but the crumbs themselves are porous. This means that water will penetrate more readily into such a soil, for the pores in this case are large between the crumbs, and every one knows that water will enter and replace the air in a bottle more quickly when the bottle has a wider mouth. This fact is of importance in irrigation practice, as water standing on the surface for some time tends to bring about the injurious effects on the soil in the manner previously described. A method that permits of water standing for some time on the land during irrigation is very far removed from the ideal principle laid down by Professor King. One should not overlook the fact, too, that just as it takes longer for water to penetrate into soils having their physical make-up injured by excessive applications of water, so will the entrance of air into such a soil be slower.

The air in the soil becomes charged with carbon-dioxide, due largely to the action of soil organisms. This accumulation of carbon-dioxide is at the expense of the oxygen in the soil, so that unless a rapid exchange can take place between the soil and the atmospheric air, the plant is likely to become unthrifty owing to the lack of the essential oxygen. Virgin soils, as a rule, have a fairly good structure, so that the irrigator must see to it that he does not ruin the physical condition of the soil by the improper use of water and thereby render the soil impervious, and so cut off the oxygen supply of the soil. This brings us to the methods of applying water to the soil and the kinds of natural waters.

Kinds of Irrigation Water.—The waters available for irrigation purposes may be classified roughly into (*a*) non-brak or non-alkaline, and (*b*) alkaline or brak waters. *Non-alkaline* waters may be further divided as follows: (1) Those carrying matter in suspension, (2) those free from suspended matter; while the alkaline or brak waters may be divided up thus: (1) Those containing sodium carbonate, (2) those

not containing sodium carbonate. *Waters containing large amounts of soluble salts, not sodium carbonate*: These waters can be used with safety only in lands which are naturally or artificially well drained, and when used in such quantities as to cause drainage through the soil so that free water does not accumulate in the soil to be evaporated at the surface, there to deposit the salts dissolved in the water. These waters are only safe when the concentration of the salts in the water used is not such as to be injurious to the plant. The use of 'such water also requires that surface cultivation be practised largely in order to reduce surface evaporation to a minimum. The salts usually present in such waters are the sulphates and chlorides of sodium, calcium, and sometimes magnesium. These salts do not injure the physical condition of the soil when present in the concentrations usually found in natural waters. *Waters not very alkaline*: Waters containing small amounts of salts in solution can be used on most soils, but care should be taken not to use large quantities, particularly on soils having poor natural drainage, for where the drainage is poor, and large quantities of water are used, the water accumulates in the soil, and having no other means of escape than by surface evaporation or by being used by the plant, a large quantity is lost in the former way, with the result that the salts contained in this water become deposited at the surface and there accumulate until the soil becomes so brak as to injure plants. The irrigator who uses saline water must be most careful to see that the natural drainage of the soil is good. If the drainage is poor, he should improve it artificially by means of tiles or open furrows. Surface evaporation must be checked as far as possible by cultivation or by growing a perennial crop, such as lucerne, which retards evaporation by shading the soil. If slightly alkaline waters are used reasonably so as not to accumulate in the soil, and if surface evaporation is largely checked, then there is no great danger. Most people use more than enough water and do not trouble about surface evaporation. *Waters containing sodium carbonate*: If an analysis of the irrigation water shows the presence of carbonate of soda—even in small quantities—it should be used with the utmost precaution, and then only on the more sandy soils, for on heavy soils the deflocculation due to the sodium carbonate will, in a few years, bring about such a breaking down of the physical condition of the soil as to preclude the growth of crops at profit. The injurious action of sodium carbonate is not confined alone to the breaking down of the soil granules and thereby retarding the rate at which water and air penetrate the soil—it also corrodes the plant-stem when in high concentration, and dissolves the organic matter in the soil. *Non-alkaline waters containing suspended matter*: These are largely flood waters. Flood waters, whether stored in dams or turned at once on to the land, usually contain a fairly large amount of suspended matter made up largely of silt and clay. When such waters soak into the soil they leave as a surface crust a deposit of this fine material. This crust when dry is frequently almost impervious to air and water, and unless stirred may smother the plants, as it were, or prevent penetration of water later on. This fine silt is undoubtedly beneficial to sandy soils; on heavy soils the silt may tend to clog up the pores of the soil, so that muddy waters must be used with discretion on such soils. At any rate, harrowing or cultivation will be essential to break

the crust so soon as this silt has become dry enough to work. *Non-muddy, non-alkaline waters*: By these are meant fresh waters, including those that contain calcium carbonate and bicarbonate in solution. These waters can be used on all soils without injury, provided they are not applied in such quantities as to bring about secondary injurious effects. No matter how "fresh" a water may be, it cannot be used excessively without risk, as will be seen later.

Methods of Applying Water.—The two chief methods of applying water to the soil are (*a*) by flooding and (*b*) by furrows, with various modifications of these. In choosing the method to use in applying water one should consider the soil, the quantity and quality of the water, and of course the crop. In the case of a perennial forage crop such as lucerne, the flooding method has most of the advantages, for the crop shades the soil most of the time, thereby preventing surface evaporation. Then, again, the lucerne crop can stand very severe cultivation without injury, so that deposits left by muddy waters on the land can be broken up. Cultivated crops such as mealies, mangels, potatoes, sugar-beets, etc., could with advantage be irrigated by the furrow method, for this method has the following advantages:—*Less water required*: As a rule, less water will be required to irrigate a certain area by means of the furrow method. The ideal principle in furrow irrigation is to apply a stream of just sufficient strength to reach the end of the furrow without any overflow. *Less work once the land is furrowed*: After the irrigation furrows have been drawn (this can be done as a rule with a double-mouldboard plough), it is a simple matter to control the water distribution. *Less loss of water by evaporation*: Since only about one-third of the surface of the soil is actually wetted, it is obvious that the evaporation must be less in the furrow method. Then, again, it is much easier to establish a mulch over the wetted portion of the soil by cultivation where furrows are used. *Water penetrates more readily into the soil*: We all know that if we wish water to enter readily into an empty tin through a hole in the top, the quickest way to accomplish this is to punch a second hole in the top of the tin and to keep one hole above, while the other is placed under the surface of the water. The former allows the air that is being replaced by water to escape readily. If there were only one hole, then the air escaping would have to bubble up through the water entering the tin. The same principle holds when irrigating by the furrow method: the air being replacêd passes out through the ridge between the furrow. This means also that as the water in the soil is used up by the plant roots atmospheric air can readily enter to replace the water. In other words, furrow irrigation facilitates the movement of air and water in the soil. This is a very important consideration where, as in heavy soils, the supply of oxygen in the soil often sets a limit to plant growth. *Less danger that brak or alkali will accumulate at the surface*: Since furrow irrigation retards surface evaporation, there is less likelihood of an accumulation of brak at the surface. *Largely prevents formation of crusts on surface*: Some soils clod and cake badly after being irrigated. When only a small part of the surface is wetted as in furrow irrigation this crusting is largely overcome. *Better growth of crops*: On heavy soils, particularly, it will frequently be noticed that the most vigorous plants are those grown on the edge of the bed. This

can be explained partly by the fact that the plant has more space in which to develop and also by the fact that the soil does not become so compacted by irrigation waters on the outside of the beds so that air containing oxygen can enter the soil more readily and a better root system can be developed. In the furrow method the soil is kept more or less loose and friable all the time. *The type of soil* is of importance in choosing the method of applying water to the lands. *Sandy soils*: Sandy soils should preferably be irrigated by the flooding method unless the water is very scarce, for in such soils the idea should be to retard the rate at which the water enters the soil. By flooding this water quickly over the surface the air cannot escape very readily, and therefore prevents the water from entering too rapidly. If the furrow method is used on sandy soils, the water will soak away at the upper end of the furrow unless the slope be very steep or unless a very strong stream of water be turned into the furrow. In either case there will be considerable danger of washing and forming "sloots." *The nature of the water*: Waters that will not penetrate into the soil readily can best be applied by the furrow method, for if such waters are applied by flooding they will tend to stand over the whole surface of soil and thereby bring about injurious effects on the soil and the crop.

WATER AND CROP RELATIONSHIP.

In the preceding pages an attempt has been made to point out the physical relationships between soil and irrigation waters. A few notes will now be given on the relationship between the crop and irrigation waters.

(1) *Optimum Moisture for Plant Growth.*—It has been found that most crops grow best in a soil containing 40 to 60 per cent. of the maximum capacity of the soil to hold water against gravity. This maximum capacity is attained when the soil has about 90 per cent. of its pore or air space filled with water. This pore space makes up about 30 to 40 per cent. as a rule of the volume of the soil *in situ*. so that the volume of the soil occupied by water at maximum capacity will be 90 per cent. of 35 equals 31.5 per cent. filled with water. Now 40 to 60 per cent. of 31.5, say 50 per cent. of 31.5, equals 15.75 per cent. of the volume of the soil *in situ*, should be filled with water in order to get optimum water-content for plant growth. In a foot section of soil we shall, therefore, need 15.75 per cent. of 12 inches equals 1.98 inch of water. In other words, in order to raise a perfectly dry soil to optimum moisture, where the pore space is 35 per cent., we should have to apply the equivalent of 1.98 inch per foot depth of soil. Soils normally contain moisture in them at the time that it becomes necessary to irrigate so that we can reckon on about the equivalent of an inch or more in each foot of soil at the time of irrigation. In order, therefore, to bring the soil to optimum moisture for plant growth about .75 inch will probably have to be applied for each foot (in depth) of soil that it is desired to moisten.

To wet a soil six feet in depth we shall require $.75 \times 6 = 4.5$ in. at each irrigation, whereas to wet a soil that is only two feet deep will require 1.5 inch. Obviously a deep soil can receive heavier irrigations at longer intervals than a shallow one in order to raise the soil to optimum moisture-content. This means that the water will be

used more economically in the deep soil, for it has been definitely proved that the loss of water from the soil by evaporation is much greater than from a free water surface where the surface is kept more or less constantly moist by too frequent irrigations. For example, Fortier, working in America, found that, where the surface of the soil was kept constantly moist, 4.75 inches of water were lost per week as against 1.88 inch from a free water surface. This only goes to show how desirable it is to choose a deep soil so that the lands may be irrigated at longer intervals, thereby reducing surface evaporation to a minimum. Let us consider now the quantity of water used per season and the crop yield.

(2) *Quantity of Water and Yield.*—Those familiar with irrigation practice know it is an established fact that the crop yield is not proportional to the quantity of water applied. Decrease in yield may often accompany further increase in water supplied above a certain point. This point where decrease in yield is first observed will depend largely on the type of soil, for crops are much better able to stand heavy applications of water on deep porous soils than on heavy impervious clays. In the accompanying tables are given some data which bear out the point mentioned. These data are taken from certain of the Utah Agricultural Experiment Station publications. A study of Table I will make clear the fact that the yield of a crop is not proportional to the quantity of water applied. At first the increase in water results in a fairly large increase in yield. Later on, however, when the water is increased from, say, 30 to 50 inches per acre, the addition of twenty extra inches results in only a very small increase, and in some cases, e.g. in the mealie, we have a decrease in yield. A glance at the yield of crop per inch of water applied makes the point even more clear, for the table shows that there is a very rapid decrease in the yield of crop per inch of water as the applications become greater. This means that the crop uses the water less economically when it is heavily irrigated.

Besides this, there are the dangers, already enumerated, to the physical conditions of the soil, and to these we must add the extra danger of "brak." In Table II we see that a given quantity of water applied to a small area of land produces about one-third the total yield of dry matter that is produced by the same quantity of water spread over four times the area of land at the rate of a quarter the quantity of water per acre. This is undoubtedly a point worthy of consideration in the arid and semi-arid sections, where water and not land is the limiting factor in plant growth. The available land is much greater than the available water, so that yield per inch of water should always be the first consideration. It is not to be assumed that on all farms results similar to those given in the tables will be obtained. The results there reported were obtained on a very deep well-drained soil. On shallow or impervious soils the decrease in yield following large applications of water would be even more pronounced. The decrease is to be accounted for, probably, owing to the fact that the larger quantities of water tend to replace and exclude air to a great extent so that one of the essential factors in plant growth, namely, oxygen, becomes deficient and limits or restricts further increase in yield.

Again, the lack of oxygen results in an increase in the activities or reduction of anaerobic bacteria, with the result that a substance

such as the nitrate essential to plants is reduced to injurious nitrite, and others such as ferrous compounds are formed from the non-injurious ferric compounds. It is no wonder then that excessive quantities of water frequently result in a falling off in yield.

TABLE I.

Yield of Crops with Different Quantities of Water.

Quantity of Water Applied in Inches.	Wheat Yield.		Maize Yield.		Lucerne Yield.	
	Per Acre.	Per Inch of Water.	Per Acre.	Per Inch of Water.	Per Acre.	Per Inch of Water
	Bushels Grain		Bushels Grain		Lb. Hay.	
5	37·56	7·56	—	—	—	—
7·5	41·54	6·39	79·14	6·1	—	
10	43·53	4·35	89·52	5·8	9884	988
15	45·71	3·05	93·93	4·6	7546	503
25	46·46	1·86	99·16	3·3	9354	374
30		—	97·12	2·7	8840	295
35	48·55	1·39	—	—	—	—
50	49·38	·99	—	—	10,813	216
55	—	—	96·78	1·4	—	—

TABLE II.

Yield of Crop in Dry Matter from 30 inches of Water applied to ONE ACRE and from 30 inches applied to FOUR ACRES at the rate of 7.5 inches per acre in latter.

Kind of Crop	Thirty Inches spread over		Ratio.
	One Acre.	Four Acres	
	Lb	Lb.	
Wheat	6,951	22,180	3·19
Mealies	15,294	13,028	2·81
Lucerne	8,133	32,072	3 94
Sugar-Beet	10,271	28,264	2 75
Potatoes	3,660	10,920	2·98

Quantity of Water and Crop Composition.—It has been found that the quantity of water used has an appreciable effect on the crop composition, and may be summarized as follows:—Large quantities of water bring about an increase generally in the ash, carbohydrate, and fibre. With smaller quantities of water protein percentage increases and there is a greater proportion of grain to straw, while the flavour and cooking qualities of crops like potatoes are improved. When we reflect on the many advantages to be derived from a judicious use of irrigation water it is hard to believe that the farming public is so poorly informed that the use of large quantities of water in irrigation is the rule and not the exception. I have yet made no special reference to the damage done to land by alkali or brak formed because of the improper use of water.

BRAK AND IRRIGATION RELATIONSHIPS.

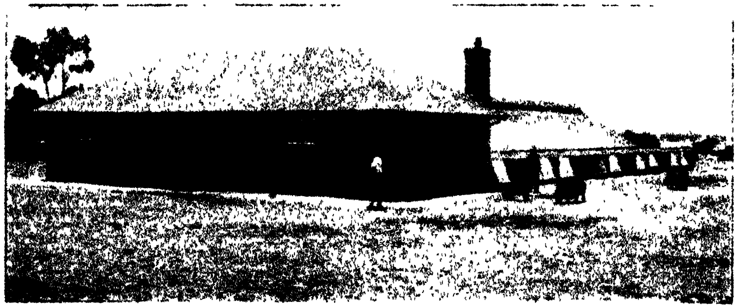
When rocks become weathered into soil a certain amount of soluble substance is formed. Part of this soluble material is useful to plants. Now in regions of abundant rainfall most of these soluble materials are washed out of the soil and carried by percolating waters into the natural drainage channels (the rivers), and thence to the sea. In the arid and semiarid regions the natural precipitation is not sufficient to bring about this leaching out of soluble substances. There the water passes down a short distance into the soil, where part of it is taken up by plant roots, while a small amount rises to the surface and is evaporated. Soluble substances tend to accumulate, therefore, in soils of dry regions, with the result that man finds these soils very productive when first he starts to irrigate. Frequently the yields start to decrease after a few years. Let us inquire into the reason why this decrease takes place on irrigated lands. We shall find usually that the drop is due either to the deterioration of the physical condition of the soil, due largely to the use of excessive quantities of water, or to the accumulation of brak or to both. When the farmer applies only medium quantities of fresh water to an arid soil containing the usual amount of soluble material, he cannot run much risk of causing the soil to become brak, provided he cultivates the surface or grows a crop like lucerne, both of which will tend to reduce evaporation. *Use of large quantities of fresh water*: What usually happens, though, is that the farmer, believing that yield will be proportional to the quantity of water applied, uses excessive amounts of water at frequent intervals and pays no heed to the drainage nor does he trouble much about surface evaporation. (*a*) *Where drainage is poor* If the water in excess of that sufficient to satisfy the maximum capillary capacity of the soil is unable to escape into some natural drainage channel, it accumulates as free water in the soil and rises into the root zone, with the result that deep-rooted plants like lucerne are drowned out, as it were. Also, on account of the surface soil being more or less kept constantly moist, a large quantity of water is evaporated at the surface, leaving behind the soluble materials that have been dissolved out of the soil. As time passes this accumulation of salts at the surface becomes so great that the plants are injured. The water-table rises close up to the surface, and as a result of these two the soil is more or less ruined. *Use of large quantities of alkaline or brak water*: If under the above conditions brak water be used, then the time taken to injure the soil will be much shorter, because the salts already contained in the water are added to those dissolved out of the soil, so that brak accumulates more quickly.

If the brak water contains carbonate of soda, not only do we get accumulations of brak, but also the rapid destruction of the desirable crumb structure of the soil, with the result that the soil becomes more or less puddled, so that even air and water can penetrate only with extreme difficulty into the soil. Here the complete ruin of the soil would be brought about. (*b*) *Excessive use of fresh water where the soil has good underdrainage*: The danger in this case is that associated with the breaking down of the desirable crumb structure of the soil and the leading out of soluble plant food materials. But while the injury to the farmer using excessive quantities of water may not

be so great in this case, there is no knowing what untold damage may be done to the farm lower down where, perhaps, the water that drains from the upper farm appears as seepage water—there to deposit on evaporation the soluble materials leached out of the soil and to cause waterlogging. *Excessive use of alkaline waters where the soil is well drained*: It is essential when using "brak" water that sufficiently large quantities be used to cause underdrainage, and one must check surface evaporation by cultivating. In this way a concentration of soluble material in the soil will be prevented. It is to be noted that the water used must never have sufficient soluble matter in it to injure plant growth. The danger, of course, in this case is to the farmer below on whose farm the salt-charged waters may appear. *When alkaline waters are used in quantities not sufficient to cause drainage*, it stands to reason that the soluble materials not taken up by the plant must accumulate in the soil and later on injure plant growth. *Excessive use of water in soil having a high water-table*: If we apply large quantities of water to the soil and the free water drains through the soil to the natural water-table, the table must rise, unless there is a means whereby the rise is prevented, say some natural drainage channel. The rise of the ground-water may result in the water reaching the root zone, especially of deep-rooted plants, with the result that the plants are drowned. If the ground water be brak, then accumulations of brak will result at the surface, due to the evaporation of water that has risen to the surface capillarily from the ground water. Brak may also be the outcome of the following: (*a*) *Leaky furrows*: The canals that lead from the reservoir always lie at some distance above the land to be irrigated. Should these furrows be leaky, then the water seeping through the soil and dissolving soluble material may strike an impervious layer, say of clay, and flow along this layer to appear lower down at the surface, there to evaporate and deposit salts, and so ruin valuable irrigable land. (*b*) *Leaky dams and reservoirs*: The same thing happens when the dams are not water-tight. I have seen a salt-mine below a storage reservoir! The salt was deposited where the percolating waters appeared at the surface below the dam after passing through salt-charged shales. This land was once used for the production of crops. It is to-day, as stated above, a salt-mine! The farmer who owns low-lying land in an irrigable valley must always run the risk of having his land rendered useless by neighbours who use excessive quantities of water higher up in the valley. Here again I can say that I have seen thousands of acres of low-lying rich valley land ruined because the farmers immediately under the irrigation canals, higher up, used water to such an extent that their drainage water appeared on the farms below, which became brak and waterlogged. I am not going to make recommendations regarding the reclaiming of alkaline lands, for that is beyond the scope of this paper, and besides I consider that prevention is better than cure. If all farmers will use their water sparingly, and will see to it that their lands are well drained naturally or artificially, I feel sure that most of our irrigation problems will disappear. We have seen how the misuse of water by one farmer may be the ruin of his neighbour.

It is essential, therefore, for irrigation farmers to work together. I have seen fit, therefore, to close this article with the following quotation: "The nature of irrigation is such as to bring into close

social relationship the people living under the same canal. A common interest binds them together. . . . If the canal breaks or water is misused, the danger is to all. In the distribution of the water in the hot summer months when the flow is small and the need great, the neighbour and his rights loom large, and men must gird themselves with the golden rule. The intensive culture which must prevail under irrigation makes possible close settlements, often with the village as centre. Out of the desert, as the canals are dug, will come great results of successful experiments in intimate rural life; and out of the communities reared under irrigation will come men who, confident that it is best, can unflinchingly consider their neighbours' interests with their own; and who, therefore, can assume leadership in advancing a civilization based upon order and equal rights. The environment of wise irrigation farming compels the belief that of all kinds of farming it may be the most enduring." (J. A. Widtsoe in "Principles of Irrigation Practice," page 476.)



The Piggeries, Glen School of Agriculture.

Outbreaks of Animal Diseases: June, 1922.

Disease.	Transvaal.	Natal.	Cape.	Orange Free State.	Transkei.	Totals for June, 1922	Total, Calendar Year, 1921.
East Coast Fever ...	2	13			4	19	212
Mange	6		2	—	—	8	272
Anthrax	56	4	11	22	28	121	1557
Dourine	—	—	3	—	—	3	50
Glanders		—	1	—	1	2	8
Tuberculosis	—	—	4	—	—	4	10
Epizootic Lymphangitis	—	—	—	—	—	—	6

PIG-FARMING IN SOUTH AFRICA.

III.

By W. A. K. MORKEL, M.Sc., Lecturer in Animal Husbandry, and Vice-Principal, Elsenburg School of Agriculture, Mulders Vlei.

OUR MORE IMPORTANT BREEDS OF PIGS (*Continued*).

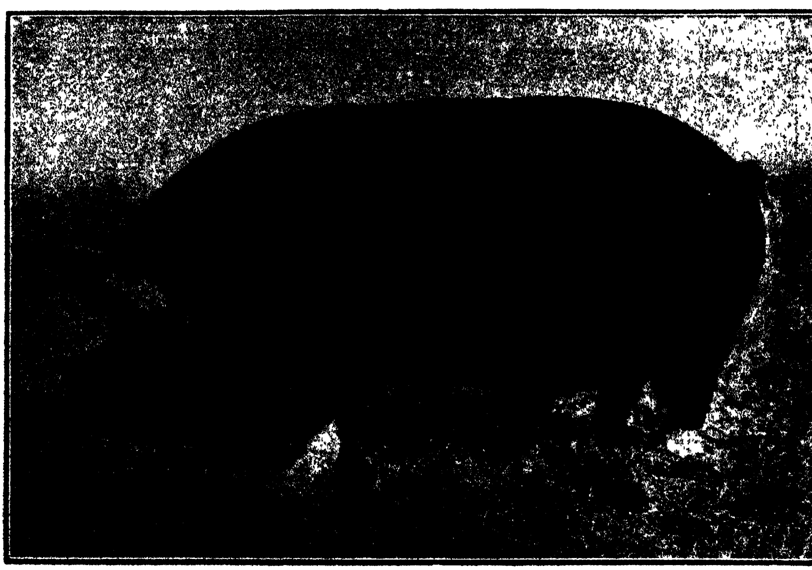
BERKSHIRES.

(*a*) *The origin* of the Berkshire, like that of the Large Black breed, is also to some extent veiled in obscurity. The breed originated in England, particularly in the counties of Berkshire and Wilts, about 1780. The original colour of the Berkshire was black, red, and white spotted. In those early days the Berkshire varied equally as much in body conformation as he did in colour from our present-day representative of the breed. He was distinctly long in the face and body, had sharp pricked ears, was very fine boned, and distinctly leggy. Even at that time the Berkshire was noted for dressing out a high precentage of carcass to live weight, and was therefore very popular among bacon curers in certain counties, particularly Wiltshire. The popularity of the Berkshire and Berkshire cross-breds was also due to the high quality of meat produced. Some authorities believe that this characteristic was inherited from the Black Siamese boars, others that it should be credited to the White, also Black and White, Chinese boars that were imported into England almost two centuries ago.

The Berkshire must be credited with the great improvement made in the Irish pigs that have in recent years been responsible for the world-famed Irish bacon. About 1870 the Berkshire was taken up by the Americans, who had come over to England particularly for the purpose of purchasing high-class Shorthorn cattle. The breed became very popular in the States and, to a lesser extent, in Canada, and being in the hands of the wealthy class, utility was to some extent sacrificed for fancy points. Hence we find that the stubby snouted, very compact, and rather small-sized Berkshire was evolved. The British breeders naturally catered for this demand for a time, because of the high prices they received, but like their American cousins they soon reverted to the utility type with more size, length of body and face, and absence of pronounced shoulder development.

The Berkshire is to-day the best known and most widely distributed representative of all the British breeds of pigs, and is among the oldest known of our improved breeds of swine. The Berkshire is most popular in its native country, England, but is also well

represented in the United States of America, Canada, Australia, the Argentine, Brazil, South Africa, and also in many parts of Europe. There is a noticeable variation in the type of Berkshire that is to be found at the present time in some of these countries. This may be attributed to such factors as local market demands, the availability of particular classes of feed, and the methods consequently adopted in feeding, and also the idiosyncrasies of individual breeders. For example, in South Africa the demand for lean pork and bacon is particularly strong, whereas in the colder countries of Europe, and also in America, the demand is more for pork and bacon inclined to the fat side. Furthermore, in America, the fat or lard type of pig is quite a distinct product of that country owing to the availability and extensive use therefore of such a fattening feed as maize, whereas in England and Europe, particularly in such countries as Denmark, the

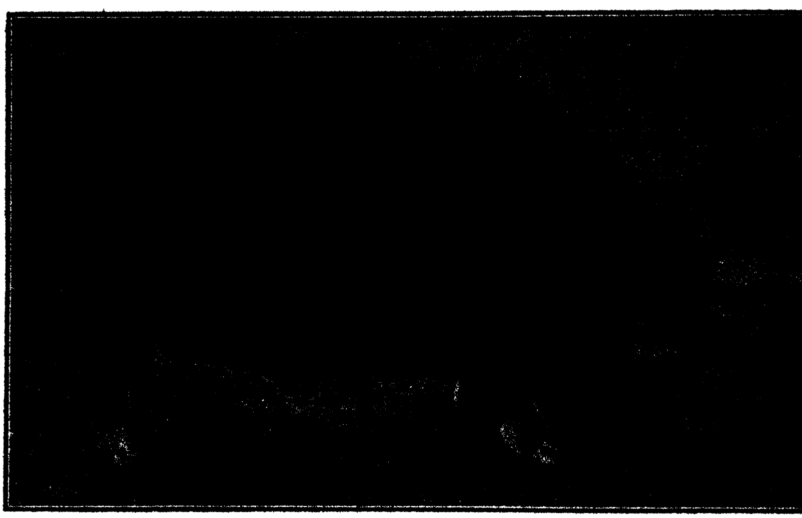


Berkshire Boar "Little John," No. 18057. Champion at the Royal Agricultural Society of England Show, 1915.

smaller grains, such as barley, rye, etc., are more available, and consequently more extensively used.

(*b*) *Breed Characteristics.*—The head is of medium size and the face broad, open and gracefully, but not excessively, dished. The jaws should be stout and prominent. A crooked or badly formed jaw is an imperfection. The neck is short, with a well-developed crest in the case of boars. The ears should be erect, of medium size, and fringed with soft silky hair. Distinctly drooping ears, or ears hanging wide apart are undesirable. However, a slight inclination forward of the ears is not objected to. The shoulders should be obliquely placed, and should not show up too prominently. There is a tendency in Berkshires for the shoulders to be rather wide and coarse, a characteristic which is gradually being bred out. However, in the

case of aged boars, a strongly developed shield should not be discriminated against. The back should be of good length, showing a strong level top line. The ribs should be well sprung and well let down in order to give good width and depth of body. The loin should be wide, level, and strongly muscled, and the rump equally well developed in these characteristics, and, in addition, should be well rounded off. The hams should be plump, broad, and well let down into the hocks. This is one of the noted characteristics of Berkshires, as is also their compactness, which is the result of excellent depth and width combined with good length of body. The flanks, both fore and rear, should be deep and well let down, so as to make a comparatively straight and trim underline running parallel to the top line. The legs and feet should be short, straight, and set not only well under the body, but also wide apart. In-bent knees or deformed legs of any kind are imperfections. The pasterns should be medium in length

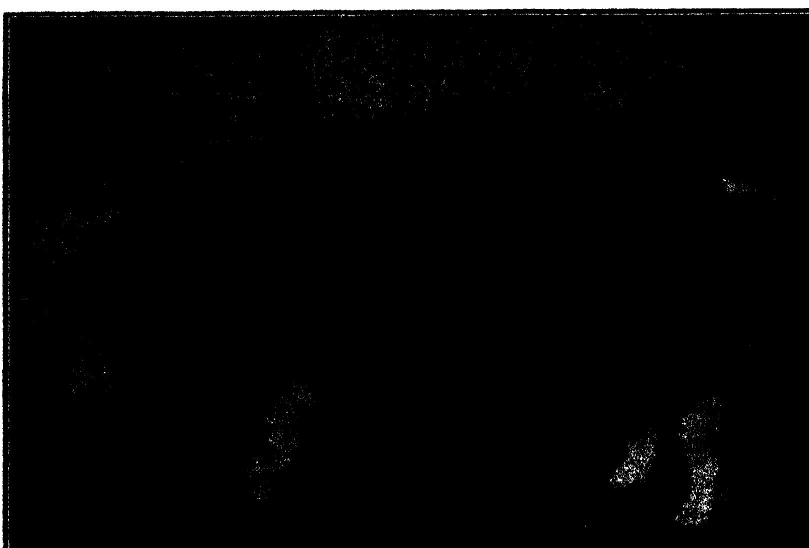


Champion and top-priced animal at the Berkshire Pig Society Show and Sale, England. She realized 320 guineas. She typifies the present-day standard to aim at.

and fairly straight. Long sloping pasterns are indicative of weakness, and are undesirable. The hoofs or cloves should be closely knit, not spreading, and of good texture. The gait should be comparatively free and of medium length. The character and style of Berkshires are quite outstanding, and are no doubt responsible in the main for their having earned the title of "The Aristocrats of the Swine World." In udder development, the Berkshire sow is on the average only fair. More often than not, only five pairs of teats are found, and not infrequently all of these are not fully developed, a fact which is no doubt due to the high degree of condition that gelts and brood sows are prone to take on if injudiciously fed and improperly managed. Berkshires are noted for their excellent quality, which may be seen in their fine bone, clean-cut joints, general refinement

of head, and fine coat of soft hair, firmness of fleshing, trim underline, and smoothness and symmetry throughout. These characteristics have undoubtedly contributed much to the popularity of the breed from a slaughter-standpoint in giving a high dressing percentage. It is not an uncommon thing to find good specimens of the breed dressing 85 per cent. of carcass to live weight. In size, the Berkshire may be considered as intermediate between the Large Yorkshire and Middle White. Good average weights of mature Berkshire boars and sows to-day would be approximately 600 and 450 lb. respectively.

The recognized colour markings of the Berkshire are a solid black body with the extremities of the feet and tail white, and also a white splash on the face. Occasionally small streaks of white hair are found on the side or under part of the jowl; also on the inner side of the ears, and just above and below the elbow. These do not



A promising young Berkshire Boar, showing trueness to breed type and excellent length

constitute a disqualification, but are looked upon merely in the light of imperfections or undesirable features. On the other hand, a perfectly black face, foot, or switch, also white markings on the outside of the ear, are all, according to the standard of excellence of the British Berkshire Society, considered disqualifications. In addition, a rose, sometimes known as a swirl, or cow-lick, is found, and also constitutes a disqualification. A fairly dense coat of soft, silky, straight hair, showing an appreciable amount of gloss or shine, is considered the most desirable. A very coarse mane should be treated as an imperfection, as may also white or sandy spots or white skin on the body.

The prolificacy of the Berkshire is only fair. The average number of pigs farrowed per litter in South Africa is seldom above six. The Berkshire is not the best of mothers under ordinary conditions, for

she has a highly developed nervous system and, in consequence, is easily disturbed, as the result of which her litter suffers. Berkshires are noted for their early maturity, despite the fact that this characteristic is not usually very apparent when they are weaners, as they invariably appear small and lacking in growthiness. Owing to the sows being only moderately good milkers, one often finds rather uneven litters.

At this Institution, Berkshires at 8½ months of age have averaged between 180 and 190 lb. live weight. The Berkshire may be classified as belonging to the lard type of swine. They ordinarily carry too much fat over the back—close upon three inches—and have not a sufficiently long enough side to warrant their being classified as baconers. For the production of porkers, the Berkshire is to be ranked in the first flight.

Bred and exhibited by Mr. Arthur Hiscock. Age 8 months 27 days. Combined weight 682 lb.

In South Africa the Berkshire (boar) Large Black (sow) cross has been used extensively for the production of baconers, and has been attended with highly satisfactory results. The reciprocal cross has also been practised, but is not recommended for the reason that it is less profitable owing to the lack of prolificacy in the Berkshire sow as compared with the Large Black sow. The progeny of the above cross have proved excellent doers, and have scaled over 200 lb. at 8½ months of age when they are ordinarily dispatched to the bacon factory. There is no doubt that the Berkshire boar has contributed very materially to the success of this cross, particularly in so far as development of ham, firmness of fleshing, and quality are concerned.

In conclusion, mention must be made of the activity and foraging ability of the Berkshire. Owing to their dark colour, and other good characteristics already mentioned, they are suitable for South African

conditions. Berkshire boars have shown themselves to be very prepotent, as may often be seen in the Berkshire (boar) Kolbroek (sow) cross, when the great majority of the progeny usually resemble the sire. Berkshire boars have played an important part in raising the standard of excellence of our grade herds, which consist for the most part of pigs of this Kolbroek type in the Western Province. They have contributed not only more size, but also firmer flesh and more early maturity. At the Smithfield Live Stock Shows in England, also the Chicago International Expositions in America, Berkshires have for many years won the highest honours in the carcass classes.

Among the more important strains, or family lines of breeding, mention may be made of—

Basildon.	Jamaica.	Swaylands.
Hammonds.	Murrell.	Thornton Hall.
Ipsden.	Manor.	Whitley.
Iwrene.	Morton	

STANDARD OF EXCELLENCE FOR BERKSHIRE PIGS.

Colour.—Black, with white on face, feet, and tip of tail.

Skin.—Fine, and free from wrinkles.

Hair.—Long, fine, and plentiful.

Head.—Moderately short, face dished, snout broad, and wide between the eyes and ears.

Ears.—Fairly large, carried erect or slightly inclined forward, and fringed with fine hair.

Neck.—Medium length, evenly set on shoulders; jowl full and not heavy.

Shoulders.—Fine and well sloped backwards; free from coarseness.

Back.—Long and straight, ribs well sprung, sides deep.

Hams.—Wide and deep to hocks.

Tail.—Set high, and fairly large.

Flank.—Deep and well let down, and making straight underline.

Legs and Feet.—Short, straight, and strong, set wide apart, and hoofs nearly erect.

IMPERFECTIONS.

A crooked jaw.
White or sandy spots, or white skin on the body.
A very coarse mane, or in-bent knees

DISQUALIFICATIONS.

A perfectly black face, foot, or tail.
White on the outside of ear.
A rose back.

COMMON POTATO PESTS.

Compiled by R. BIGALKE, M.A., Lecturer in Zoology, School of Agriculture, Glen.

It is necessary that an article* on potato culture should include some information on the common insect pests with which the potato grower has to contend, for these pests are one of the factors responsible for a diminution in his returns.

Detailed information on the pests that have been selected here may be obtained from various departmental publications, and it is for this reason that the present account is somewhat brief. For the sake of convenience the sources from which further information may be obtained are indicated in the "literature paragraph," which terminates the discussion of each pest.

ROOT GALL-WORM [*Heterodera radicicola* (Greeff) Müller.]

Root gall-worm disease of potatoes is common in the potato-growing districts of the Union, and complaints are frequently received. It is not caused by an insect but by a kind of plant-feeding worm so small that it can hardly be seen with the naked eye. Besides attacking potatoes this worm also causes enlargements of the roots of peach, fig, grape, banana, pomegranate, tobacco, beet, beans, cowpea, tomato, watermelon, cucumber, squash, pumpkin, carrot, parsnip, carnation, sweetpea, snap-dragon, and many other plants. The list of host plants is a very large one, and more than 500 species have been recorded as being attacked by this parasite.

Appearance of Diseased Potatoes.—The surface of a diseased potato is more or less wrinkled and covered with nodules or small lumps; in early stages of the infestation the potato may be firm and the nodules so inconspicuous that they are easily overlooked, but when the disease is more advanced the nodules are prominent, and the potato is more or less shrivelled, and of a softer consistency than normal. If a badly infested potato be cut open a number of small brownish spots a little smaller than the head of a pin will be seen at a distance of about quarter of an inch or less below the surface. If one of these brown spots be opened carefully and examined with a lens, it will be found to contain a very small white pear-shaped object; this is the gravid female worm, which has assumed the swollen appearance because of the large number of eggs within her body. In early stages the areas in which the worms are embedded may be slightly or not at all discoloured.

Potatoes which are badly diseased may shrivel up to half the natural size, are softer and less nutritious than normal, and not desirable for human consumption. The presence of the worms in the

* "Potato Culture," by G. J. Bosman, published in July, 1922, issue of the *Journal*.

Roots of Cucumber Plant, showing Swellings caused by Gallworm, Root-Knot, or Eelworm. Approximately natural size

tubers also affects the keeping properties; infested tubers will not keep as long as healthy ones, and are more liable to destruction by bacterial and fungous diseases.

Life-history.—The life-history of this worm has not yet been completely elucidated in South Africa, and need not be discussed here. For our purpose it will suffice to note a few points.

The adult gravid females occur in the "galls" or "knots" of the roots of infested plants; the irritation caused by their presence brings about a rapid multiplication of the surrounding cells, and this eventually leads to the formation of the root galls. By means of a spear-like structure situated in the head-end of the body the larva is able to pierce its way out of a root into the soil. There it may lie dormant for some time, and then seek out and penetrate another rootlet, or if conditions are favourable it may not abandon the root within which it was hatched, but may migrate to adjacent healthy tissues and undergo sexual differentiation there.

American studies show that the time required for the completion of the life-cycle may be four weeks or more, according to the temperature of the soil. The winter is passed probably most frequently in the larval stage in the soil, but in the case of galls on perennial roots the worms may overwinter in these in a more advanced stage, even as practically mature and perhaps already fertilized females.

Control.—It may be stated at once that an efficient and practical method of control is not known. Hence the measures adopted are largely of a preventive nature. For infested lands which do not bear perennial crops the following measures are advised:—

(1) Keep the land absolutely free from all vegetation for two years; this is the most efficient method, but is usually not practicable. If the land can be kept free from all vegetation for a shorter period, say three or six months, during the hottest part of the year, this will undoubtedly be of some assistance.

(2) Do not plant susceptible crops on infested lands for two or three years. The following are more or less immune to root-knot: Velvet bean, peanut, most varieties of winter oats, Johnson grass, crab grass, Japanese barnyard millet, broomcorn millet, pearl millet, timothy, rye, sorghum, kaffir corn, wheat and maize.

(3) In gardens it is a useful measure to uproot worthless plants and to destroy them by burning. If such plants are left until the tops have dried up and are then broken off, the soil will become infested with worms which are liberated when the roots decay.

(4) Rotate susceptible crops, such as the potato, with more or less immune crops.

(5) Avoid the use of seed-potatoes showing nodules.

(6) Heavy applications of potash fertilizers often greatly reduce eelworm injury. Unless the soil already contains an abundance of potash, potatoes will respond well to such treatment.

(7) In Europe trap-crops have been used successfully against a related species of gall-worm known as the beet-nematode (*H. Schachtii* Schmidt). It appears that few experiments have been conducted to test the value of trap-crops against *H. radicicola*, and these were not

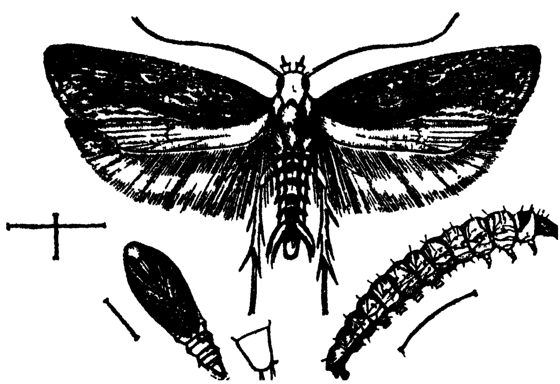
successful Whether trap-crops are of any value under South African conditions is not known.

Literature.—"Root-knot, Gallworms, and Eelworms," by C. Fuller, *Agricultural Journal of the Union of South Africa*, September and November, 1913; "Root Gallworm," by R. Jack, Bull. 147, Salisbury, Rhodesia; "Economic Importance of Nematodes," by J. Sandground, *South African Journal of Science*, July, 1921.

THE POTATO TUBER MOTH (*Phthorimaea operculella* Zell.).

This insect is widely distributed and is considered to be the most serious insect-pest with which the South African potato-grower has to contend. The larvae also attack tobacco and the stinkblaar (*Datura stramonium*)

Appearance of Infested Potatoes.—The caterpillars eat their way into the tubers and sometimes work right to the heart of the potato, while at other times they burrow just below the skin. The burrows, especially the openings to them at the surface of the tuber, are usually



THE POTATO TUBER MOTH

Adult Moth above, larva below at right, pupa at left, with side view of enlarged anal segment all greatly enlarged.

(*After Howard, U.S. Department of Agriculture.*)

marked by a quantity of coloured excrement. The eye is a favourite place for the entrance to a burrow. Sometimes the tubers are only slightly injured, while at other times they may be entirely ruined.

Life-history.—The adult is a small moth about two-fifths of an inch long, and with a wing expanse of about five-eighths of an inch. It is greyish-brown in colour with obscure darker markings; the hind-wings, which are whitish in colour and fringed with long hairs, are hidden when the moth is at rest. The small shining white eggs are laid singly either on the tubers or on the tops, and when the caterpillars hatch out they bore into the tuber, stem, or leaf, as the case may be. In the leaf the larva commonly burrows between the upper and lower surface, or it may fasten two leaves together and feed between them.

When full-grown the caterpillar is about half an inch long and of a dirty-white colour with a greenish tinge. It now spins a light silken cocoon, and within this it changes into a pupa In storehouses the

cocoons are frequently found in the eyes of potatoes, because these form convenient depressions. Crates, boxes, bins, and bags may also be plastered with cocoons. In the field the pupae are often found just at the surface of the soil. After about ten to twelve days the adult moths leave the pupal sheaths. The period required from the egg to the adult is commonly from 6-8 weeks, and there are several generations in a year, the number varying with the temperature.

How Tubers become Infested in the Soil.—The female moths will oviposit on any exposed potatoes which they may find in a field. They may occasionally reach tubers through cracks in the soil, and may possibly reach tubers that are only slightly covered. This, however, accounts for only part of the infestation. It has also been suggested that the larvae bore down through the stems of the plants into the tubers, but this has been shown to be incorrect. Most of the infestation is due to the fact that the larvae leave the tops to burrow into the soil and thus enter the tubers. That the wilting and dying of the tops cause the larvae to migrate to the soil is shown by the fact that in summer very few larvae do so until the tops begin to die. Cold weather also induces the larvae to migrate from the tops before they have begun to wilt.

Control: Natural Enemies.—Many larvae are attacked by small wasp-like parasites (*Omorgus phthorimaea* Cushman) which hatch out from the cocoons of the moth.

Control: Artificial Methods.—(1) The larvae do most of their feeding within the leaf or stem, and can therefore be caught with sprays only when they bore their way into the leaf or stem. Experiment shows that spraying is of little use in the control of the moth.

(2) The most important control measure is compact hilling, i.e., keeping the potatoes well ridged and covered with soil after the blossoming period. By thus increasing the depth of soil through which the larvae must burrow to get at the potatoes, many fail to accomplish their object. The correct time for hilling is just after the blossoming period, or in the case of late potatoes before the weather becomes very cold.

(3) Badly infested potatoes should not be used as seed, but should be destroyed or fed to pigs or sheep.

(4) Prepare the soil well before planting, and plant the potatoes fairly deep, at least four inches.

(5) Do not leave dug potatoes exposed in the field overnight. If they cannot be bagged immediately cover them well with a sailcloth. Unmarketable potatoes (small and badly infested ones) should all be gathered up and fed to pigs or sheep.

(6) Sort out infested tubers, and store the remainder in a cool room which is well ventilated and screened, if possible, so that moths from outside sources are unable to gain access to the uninfested potatoes.

Literature.—"The Potato Tuber Moth," by W. F. Schlupp, Bull. 4, 1917, Union Department of Agriculture; "The Potato Tuber Moth and its Control," by W. Moore, *Union Journal of Agriculture*, March 1912.

THE POTATO LADYBIRD BEETLE (*Epilachna dregei* Muls.).

Many ladybirds are valuable friends of the farmer, since they render assistance in the control of such important pests as scale insects and plant-lice. The present species is, however, a plant-feeder found all over the Union and in Rhodesia. It causes damage to various crops, both the adult and larvae feeding on the foliage of the potato, pumpkin, vegetable marrow, cucumber, turnip, radish, melon, bean, parsnip, spinach, and wild solanaceous plants; the potato is its favourite food-plant.

The presence of this insect in a potato-field is readily determined by finding the spiny yellowish larvae or the adult beetles on the foliage. The adult is oval and strongly convex in form, each wing-cover having 8 or sometimes 10 buff spots. The ground-colour of the wing-covers is black, the legs and the ventral side of the body being buff.

Life-history.—The female deposits from 75 to 110 yellow eggs in three or four clusters on the under surface of the leaves. After 7 to 11 days the yellow larvae hatch out (if the atmosphere contains much moisture many eggs do not hatch) and are at first very inconspicuous and gregarious in their habits. They are provided with long branched spines which are white immediately after hatching, but soon become darker. After the first moult, which occurs 10 to 14 days after hatching, the larvae scatter over the plants; they feed on the lower epidermis of the leaves, whereas the adults usually feed on the upper.

After the lapse of 28 to 36 days the larvae are full grown and ready to pupate. For this purpose they seek sheltered spots on the food-plants, and, hanging themselves by the tail-end to a leaf, twig, or other convenient place, transform into yellow pupae. After 6 to 10 days the adults emerge from the pupal sheaths. The complete life-cycle takes on an average 49 days, and there are two generations in a year. During the winter the beetles hibernate under the bark of eucalyptus trees, stones and rubbish near gardens, and potato fields.

Control.—Both larvae and adults are comparatively easy to control because of their sluggish habits and the tendency which they have to remain on particular leaves until these are entirely skeletonized.

It is essential that spraying be resorted to as soon as the larvae have been observed on potato foliage, for in the early stages the young are very gregarious, and hence more easily destroyed than later, when they have scattered over the plants.

Use arsenate of lead at a strength of 3 lb. of the paste or $1\frac{1}{2}$ lb. of the powder for every 50 gallons of water, and endeavour to cover both the upper and lower surfaces of the leaves with the spray. Instead of lead arsenate paris green could be used in the proportion of 1 lb. to 100 gallons of water, to which 2 lb. of slaked lime are added in order to neutralize any soluble arsenic which may be present.

Literature.—"Two Ladybirds injurious to Potato Plants," by R. Jack, Bull. 158, Salisbury, Rhodesia.

THE CONTROL OF CODLING-MOTH IN PEARS IN SOUTH AFRICA.

Dusting *versus* Liquid Spraying.

By F. W. PETTEY, B.A., Ph.D., Entomologist, Elsenburg School of Agriculture and Experiment Station, Mulders Vlei.

INTRODUCTION.

THE advantages of power dusting, when it is successful, are (*a*) rapidity of application, since dust may be applied 5 to 10 times more rapidly than liquid, (*b*) saving of labour, as it requires only two men, i.e. a driver and a manipulator, and (*c*) a comparatively lighter outfit than a spray equipment, which enables the fruit grower to work on steep hillsides or on low-lying ground immediately after a rain.

Under Cape Province conditions it would have the advantage of enabling the fruit grower himself to apply the material to his trees, and early in the morning before the severe south-east wind interferes with operations. In dusting, there is no water supply problem, a decided advantage in many parts of South Africa, where orchards are on steep hillsides and where water is often scarce. The greatest disadvantages are the greater cost of material, and especially the inefficiency of dusting for the control of scale insects and other sucking insects, and peach leaf curl. Consequently, at the present state of dusting efficiency, an outfit for this purpose could only be a supplement to the spray machine. A power duster, were it successful, would be of the greatest advantage to the large fruit grower in enabling him to apply the insecticide to his trees in the required time, with practically five times less spray machinery. Comparatively cheaper labour and more expensive lime in South Africa tend to minimize the advantages of the dusting method of control.

In 1918 the writer considered that improved power dusting for the control of orchard pests had developed to such an extent in Canada and the United States that the time for giving it an exhaustive trial in South Africa had arrived (1). Through the enthusiastic support of the Chief of the Division of Entomology (C. P. Lounsbury), suitable machinery was procured, and experiments were undertaken, based on the materials and methods reported to be successful in the control of codling-moth and scab in apples in North America. Mr. Lounsbury, in a letter to the writer in 1918, wrote: "I imported a Jumbo duster into South Africa when the dust craze struck the Ozark region about fifteen years ago, and some work was done with it at Meerlust." At that time, however, dust materials and machinery were far from satisfactory. The paris green and lime were much too coarse, and the machinery was not well adapted for dusting.

Ackerman, in the *California Bulletin*, Department of Agriculture, Vol. XI, No. 1, 1922, is the only scientist who has published

records of orchard power dusting in the control of codling-moth in pears. Since the records present results of work conducted only in one season, the Elsenburg records should answer more decisively the question of the efficiency of dusting under varying climatic conditions. Ackerman concludes that dusting cannot be recommended as

FIG. 1. Power Dusting of Apples. (From Cornell Bul. 354.)
The same kind of duster was used in the Elsenburg orchard.

FIG. 2. Power Duster.

an efficient method of controlling codling-moth in pears in California. Four and five dust applications failed to control codling in Williams pears, whereas under similar conditions four liquid sprays gave satisfactory control.

POWER DUSTING EQUIPMENT.

In the dusting tests at Elsenburg a large-type 2½-horse-power duster was used (see Figs. 1 and 2). The lime-sulphur, lead-arsenate powder, and dehydrated copper-sulphate used were of more than 200 mesh to the inch fineness, and free from grit. The dusted trees consisted of plots of three rows in 1920 and in 1921, and of two rows in 1922, and were banded for trapping larvae, to avoid as much infestation as possible in adjoining spray plots, each of which consisted of at least three rows. The trees selected for records occupied the middle of each plot.

RESULTS OF EXPERIMENTS.

Table I shows that, at Elsenburg, power dusting was markedly inferior to power spraying in the control of codling-moth for three successive years. Table II demonstrates that dusting was considerably less efficient than spraying in the control of fusicladium on Louise Bonne pears during two seasons, and it failed to control codling-moth in this variety.

Table I.—Power Dusting versus *Liquid Spraying, Codling-moth Control.*

Plot	Materials.	Year	No. of Trees	No of Applications	Total Fruit	Wormy Fruit	Per cent. Wormy.
Kieffer	*Trees.*						
1. Liquid	2½ lb lead arsenate paste, 50 gals. water	1919-20	3	6	2,885	1,226	42·0
2. Dust ..	85 lb. lime. 15 lb. lead arsenate	1919-20	3	6	2,173	1,126	51·0
3. Dust ...	85 lb. talc, 15 lb. lead arsenate	1919-20	3	6	2,905	1,544	53·0
1. Liquid	1¼ lb. lead arsenate powder, 40 gals water	1920-21	3	6	3,159	256	8·1
2. Dust ...	85 lb. lime, 15 lb. lead arsenate	1920-21	3	6	2,080	635	30·0
1. Liquid	1¼ lb. lead arsenate, 40 gals. water	1921-22	3	7	5,182	261	5·0
2. Dust ...	85 lb. lime, 15 lb. lead arsenate	1921-22	2	7	3,294	1,209	36·0
Check ...	None	1919-20	1	0	953	740	77·0
Check ...	None	1920-21	1	0	1,014	743	73·0
Check ...	None	1921-22	1	0	609	472	77·0
Duchesse	*Trees*						
1. Liquid	2½ lb. lead arsenate paste, 50 gals. water	1919-20	3	5	1,724	581	33·0
2. Dust ...	85 lb. lime, 15 lb. lead arsenate	1919-20	3	5	1,966	917	46·0
Check ..	None	1919-20	1	0	798	589	72·0
Beurré	*Hardy Trees.*						
1. Liquid	1¼ lb. lead arsenate, 40 gals. water	1920-21	3	5	4,729	509	10·7
2. Dust ...	85 lb. lime, 15 lb. lead arsenate	1920-21	3	5	2,401	981	40·0
Check ...	None	1920-21	1	0	578	397	68·6

* The comparatively high percentage of codling for the season of 1919-20 was evidently due to a very small crop of pears in the orchard as a whole, following a large one, and to the failure of dusting and other questionable arsenicals tested.

Table II.—Power Dusting versus *Liquid Spraying, Codling-moth and Fusicladium Control.*

Plot.	Materials.	Year	No. of Trees.	Codling Applications.	Total Fruit.	Wormy Fruit.	Fusicladium Infested.	Per cent. Wormy.	Per cent. Fusicladium.
Louise Bonne Trees.									
1 Dust ...	Copper sulphate, lime, lead arsenate	1921-22	2	5	1,203	636	137	52·0	11·3
2. Liquid	Lime, sulphur, lead arsenate	1921-22	3	5	4,230	211	397	5·0	2·6
3. Liquid	Lead arsenate, bordeaux	1921-22	3	5	2,224	179	169	7·3	4·0
Check ...	None	1921-22	1	0	391	280	169	71·0	43·0
1. Dust ...	Copper sulphate, lime, lead arsenate	1919-20	3	5	3,835	1,484	189	38·0	12·0
2. Dust ...	Lime, sulphur, lead arsenate	1919-20	3	5	1,368	659	214	48·0	15·0
3 Liquid	Lead arsenate bordeaux	1919-20	3	5	3,009	1,472	140	49·0	4·6
Check ...	None	1919-20	1	0	1,432	880	422	61·0	29·0

NOTE.—Plot 1 (dust) had two applications of 12 lb. dehydrated copper-sulphate powder, plus 88 lb. lime, before blossoming, 10 lb. of dehydrated copper-sulphate plus 75 lb. lime, plus 15 lb. lead-arsenate powder, for the first two codling applications, and three later codling applications of 85 lb. lime, plus 15 lb. lead-arsenate powder.

Plot 2 (dust) had two applications of very fine sulphur before blossoming, 85 lb. sulphur, plus 15 lb. lead-arsenate powder, for the first two codling applications, and three later codling applications of 85 lb. lime, plus 15 lb. lead-arsenate.

Plot 2 (liquid) had two foliage sprays of Capex lime-sulphur diluted 1:45 before blossoming, 1½ lb. lead-arsenate powder in 50 gallons Capex lime-sulphur, diluted 1:50, for the first two codling sprays, and three later, consisting of 1¼ lb. lead-arsenate powder in 40 gallons water.

Plot 3 (liquid), 1921-22, had two applications of bordeaux (4:4:50) before blossoming, 1¼ lb. lead-arsenate powder in 40 gallons bordeaux (4:4:40) for first two codling sprays, and three later sprays of 1¼ lb. lead-arsenate powder in 40 gallons water.

Plot 3 (liquid), 1919-20, had two applications of bordeaux (4:4:50) before blossoming, 2½ lb. lead-arsenate paste in 50 gallons bordeaux (4:4:50) for first two codling applications, and three later sprays of 2½ lb. lead-arsenate paste in 50 gallons water.

CONCLUSIONS.

The Elsenburg dusting experiments were effected under favourable weather conditions, early in the morning, often with dew on the foliage and fruit, when there was no wind, and no rain for at

* The comparatively severe infestation of codling in the 1919-20 fruit season was probably due to an abnormally small crop of fruit in the orchard as a whole, and to a large source of infestation from the dusted trees.

least several days following applications, and practically no rain at all after the first application for codling control. Results, therefore, demonstrate conclusively that dusting under South African conditions will not satisfactorily control codling-moth and fusicladium on pears. The writer attributes this failure to the smooth nature of the leaf surface, and particularly to the surface of the fruit in comparison with that of apples, which often have a hairy or waxy surface, and to the fact that codling infestation is severe and has three broods in a season in South Africa. The violent south-east winds which prevail in the Western Province during the truit season have a tendency to remove the dust from both fruit and leaves, even if it is applied in the absence of wind. Mr. Dicey, of Orchard Siding, who is to be commended for his progress in attempting power dusting for codling control, found it to be a failure in both apple and pear orchards in 1920. Dusting, however, will play an important part in the future in the control of insect pests. It is now used with great success in the control of tobacco, potato, strawberry, and cotton pests in America, and appears to be successful in the control of scab and codling-moth on apples where there is only one or a partial second brood of the insect each season (2). Dusting of peaches for certain fungous diseases has been found to be as satisfactory as spraying in the United States (2). The control of codling-moth in walnuts by dusting is also receiving attention in California. It is quite possible that dusting machinery and materials will be so improved in the near future as to extend this method of control considerably and even to include the control of sucking insects. At present, however, its application in South Africa is confined to the control of wattle insects in Natal, where the Chief of the Division of Entomology had experiments begun several years ago, and which are still in progress.

ACKNOWLEDGMENTS.

The writer acknowledges the valuable suggestions given by the Chief of the Division of Entomology concerning this work, the helpful co-operation of Mr. Shaw, horticulturist, in the use of the orchard, and the co-operation of Mr. Baker, botanist, in the determination of fusicladium infestation. Dr. Watson-Smith, of the Cape Explosives Works, gave valuable assistance in having the materials especially prepared for these experiments.

LITERATURE CITED.

(1) Bulletins No. 345 and No. 369, Agricultural Experiment Station, Cornell University. "Dusting as a Substitute for Spraying," by Whetzel and Blodgett, in Proceedings of Sixteenth Annual Meeting of the New York State Fruit Growers' Association, January, 1917. "The Present Status of Dusting Apple Trees," by Leonard, in Quarterly Bulletin No. 3, Maine Department of Agriculture, 1920. Numerous other references.

(2) "Dusting *versus* Spraying of Apples," by Quaintance, in the *Journal of Economic Entomology*, Vol. XIV, April, 1921.

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INQUIRIES AND REPLIES.

SELECTED LETTERS FROM FARMERS.

[Hereunder are a number of recent letters replied to by the various Divisions and Schools of Agriculture concerned. They are selected for publication as being of interest to farmers generally in the localities affected. In each case the area only from which the inquiry emanates is given: as the replies must necessarily be curtailed, they will indicate, when required, literature from which further information may be had.]

Globe Artichoke.

Dohne, Cape.—Could you tell me the length of life of the Globe and Spanish Cardoon artichokes? I have been going in for the above plants pretty largely as a feed for stock in time of drought, being under the impression that once planted they would last a number of years; but a few days ago I was surprised to see in a catalogue that the Globe only lasted three years. Which is correct?

The Horticulturist, Grootfontein, replies: The Globe artichoke is a perennial and will live for a number of years. When grown for culinary purposes, fresh plantings are generally made every two or three years from suckers. (Read "Vegetable Garden," by Watts.)

Cape Gooseberry.

Addo, Cape.—Will you please inform me on the following points: (1) Where can I get Cape gooseberry seed? (2) How deep should it be sown? (3) How far apart should plants be in the rows, and the distance apart of the rows? (4) What soil suits it best?

The Lecturer in Horticulture, Grootfontein, replies: (1) Cape gooseberry seed may be obtained from most nurserymen. (2) Seeds are generally sown in tins, picked out and transplanted when about three inches to four inches high and having about eight leaves. Seeds should be covered with about an eighth of an inch of fine soil. (3) Allow three feet between the plants in the rows, and allow about four feet between the rows. In districts where they make considerable growth they are sometimes planted a little further apart, as picking is a difficult process if planted too close together. (4) Not very particular about soils, but "damp off" badly when young in badly drained situations.

South African Swiss Milk Goats.

Heidelberg, Transvaal.—Kindly advise me on the matter of the lactation period of the South African-bred (grade) Swiss milk goat.

The Division of Dairying replies: Regarding the duration of the lactation period, a Swiss goat ewe will usually remain in milk, provided she is well fed, until a few weeks of the time at which she is due to kid again, unless, of course, she is purposely dried off earlier.

Mildew in Cheese.

Outjo, S.-W. Africa.—What is the cause of mildew in cheese and the prevention?

The Division of Dairying replies: If you find the mould right inside the cheese it may be due to mouldspores having fallen into the curd while the cheese is being made, in which case the room in which you are making the cheese is probably badly infected with the mould, and the only way to prevent the trouble will be to have the room thoroughly cleansed from floor to ceiling with hot water, in which a small quantity of soda has been dissolved or formalin mixed. All woodwork should be thoroughly scrubbed. It may be, however, that the mould has penetrated the cheese while in the curing-room through cracks or other apertures in the rind, and in this case the curing-room should be treated in a similar manner to that suggested for the making-room, particular attention being given to the shelving. A certain amount of mould appearing on the outside of the cheese is not harmful or objectionable provided it is not in excess; in the latter case, wiping the cheese daily with a cloth which has been wrung out in a weak solution of formalin will act as a preservative.

First Grade Cream.

Sandflats, Cape.—I am continually getting my cream "third graded" by the factory. What is the cause of this?

The Lecturer in Dairying, Grootfontein, replies: A third grade cream is caused by lack of attention to cleanliness in its production. Personally supervise the milking process and carry the milking out in a cleanly manner and you will no longer produce "third grade cream."

Read the bulletin "Why Cream Tests Vary and How to Produce a First Grade Cream" (U.R. 82/1915), obtainable from the Editor, *Agricultural Journal*, Union Buildings, Pretoria.

"Sleepy Cream."

Somerset East, Cape.—Since the cold weather has started I have experienced great difficulty in getting my butter to "break." After turning the churn for about two hours the butter often still shows no signs of "breaking." Surely this period is longer than should be necessary.

The Lecturer in Dairying, Grootfontein, replies: Your trouble is probably due to one of the following causes: (1) Churn too full or not full enough. In winter always have the churn at least a third full, and not more than half full. (2) Cream too cold. In winter it is usually necessary to raise the churning temperature to from 56° F. to 62° F. Also time should be taken to ripen your cream until it has a clean sharp acid taste. Sweet cream takes much longer to churn and does not make such good butter.

Paralysis Tick.

Cradock, Cape.—I am losing several young Merino lambs at present. They get a sort of paralysis and eventually die from starvation unless I put an end to them. My neighbour has had cases amongst his blackhead Persian lambs. He declares it is a tick, and I am sending you a tick taken from a blackhead Persian lamb.

The Lecturer in Veterinary Science, Grootfontein, replies: The condition described by you is probably due to the paralysis tick. The only remedy is to remove all the ticks from the sheep by hand-picking or by dipping. A dose consisting of a tablespoonful of paraffin has also been recommended, but I am afraid that the beneficial results of this are only temporary.

Loss of "Pinus insignis."

Halesowen, Cape.—I have to thank you for your report on the three small *Pinus insignis* plants forwarded to you recently. Eight hundred more plants have since been received and apparently are suffering from the same disease. Two preparations have been tried on them without much success, and I should be pleased if you will have the sample, forwarded under separate cover, examined for me.

The Principal, Grootfontein, replies: The *Pinus insignis* specimen has been examined without any special abnormalities being found. The most probable cause of your losing a number of the pines is that they have been allowed to grow too large in the tins before planting out. This would produce a rootbound condition and consequent unhealthiness. Pines are sensitive to overcrowding, and if allowed to grow at all large should be kept separately in half paraffin tins.

Spraying Fruit Trees.

Uitenhage, Cape.—Please supply me with formulae for spraying the various fruit trees with winter and spring sprays, particularly apples and peaches.

The Lecturer in Botany, Grootfontein, replies: The following formulae for winter and spring sprays are recommended:—

Winter Spraying.—(1) Copper sulphate, 1 lb.; water, 25 gallons. (2) Lime sulphur. The dormant spray is used at double summer strength, and for the commercial brands would work out at about lime sulphur 1 part and water 20 parts. The copper sulphate may be used on both apples and peaches. Lime sulphur gives very good results, with apples especially.

Summer Spraying.—As soon as the leaves appear the ordinary summer formulae must be reverted to in order to prevent the foliage from being scorched. For trees with delicate foliage, like peaches, use bordeaux mixture of strength 4 : 4 : 100; for those with tougher leaves, like apples, make the strength 4 : 4 : 50. Lime sulphur is also very effective used in the proportion of 1 part lime sulphur to 40 parts water (or 50 parts in the case of tender foliage).

Deciduous Fruit Farming.

Johannesburg.—I am anxious to take up farming with deciduous fruit: kindly advise me where I should look for land. I am told not to go further afield than 150 miles from Capetown. I have a capital of about £3000.

The Chief, Division of Horticulture, replies: It is not at all necessary for fruit growing to be a success that one should start not more than 150 miles from Capetown. The 150-mile radius certainly includes the bulk of the deciduous fruit-growing areas. Going north this would land you about Robertson, Montagu, Nuy, etc., in which areas both deciduous trees and grape vines thrive. Land there is very costly, anything from £50 to £150 per morgen, and even more if laid out in orchard, with homestead, etc. With a capital of from £2500 to £3000 a place might be obtained in going order, but it would be small if all laid out to fruit or vines. Around Paarl, Stellenbosch, Ceres, Elgin, French Hoek, and the Drakenstein Valley there are good farms, but the prices asked in most cases at the present time would almost preclude even an experienced man making decent interest on his money.

One of the most reasonably priced parts of the Union is about George, but that is somewhat over 300 miles from Capetown. Apples and other fruits grow well, and something might be done with pigs and dairying.

No one should purchase a farm without seeing it himself or getting a reliable friend or agent to do so.

You might get from the Publicity Department, South African Railways and Harbours, Johannesburg, the booklet, "Farming Opportunities in the Union of South Africa."

Castration of Pigs.

Clanwilliam, Cape.—When is the best time to castrate pigs?

The Principal, Elsenburg School of Agriculture, replies: It will depend entirely upon whether you are breeding on commercial or pure-bred lines. If on the former, then it is ordinarily best to castrate at about six weeks of age, or in other words, two weeks prior to weaning. By so doing, the youngsters will have got over the operation by weaning time, and will be fit to go ahead, and make good gains without any set back, which is usually experienced when castrating at a very much later age. On the other hand, if one is working on pure-bred lines, it is best to follow the same system with those boar pigs that are noticeably weak, and below standard. Those that are at all doubtful should ordinarily be given the benefit of the doubt, and gone through again when they are about four months of age. If they are castrated at a later age, say about six months, they will usually be found to have developed a certain amount of crest, and therefore would have too staggy an appearance to be disposed of as baconers when eight and a half months of age. Furthermore, the operation can be done with greater ease and less risk of loss when the pigs are still suckling their dams. At this age they do not go off their feed so easily, a fact which is no doubt partly due to the solacing effect of being in company with others in the same boat, and also having their dam close at hand. Read the Bulletin "Pigs and Piggeries."

Weaning of Pigs.

Stellenbosch, Cape.—When should sows be weaned of their litters and why?

The Principal, Elsenburg School of Agriculture, replies: When breeding on commercial lines it is best to adopt the practice of weaning your litters at eight weeks of age. By so doing, it will be possible to obtain two litters per year from each sow. This practice will be attended with success only when provision is made for teaching the youngsters to utilize such feeds as separated milk and pollard at an early age. Ordinarily, sucklings will commence utilizing such feed at three to four weeks of age, when a creep should be provided in one corner of the sow's pen. A small shallow trough should be used to put inside the creep, and a mixture of pollard and separated milk in the proportion of one to four by weight can be fed at the beginning. In this way the litter will not prove such a drain on the sow, in consequence of which she will be in fair condition by the time her pigs are weaned at eight weeks of age, and therefore likely to settle again in pig within a couple of weeks of weaning. It is also a good practice to sprinkle a handful of soaked mealies about the pen, so that the youngsters can learn to find their own food, and be able to utilize their ration best when weaned. If, however, one is breeding pure-bred stock, and particularly if primarily for show purposes, better results are obtained by weaning the litter at ten to twelve weeks. According to this system, it is customary to have but three litters in two years. There is no doubt that the longer the litter is allowed to suckle, the greater is their development and promise for show and other purposes, but it is the more expensive of the two systems. Read "Pigs and Piggeries," Bulletin No. 2, 1919, obtainable from the Editor, *Journal of Agriculture*. Price 3d.

Worms in Chickens.

Paarl.—Please let me know a simple and effective remedy for worms in chickens.

The Principal, Elsenburg School of Agriculture replies: A simple method is to put a few drops of Kerol in the chickens' water from the time the chickens hatch, just sufficient to show the water has been treated. If the worms still show from four weeks upwards, dip all the grain in a 5 per cent. solution of Hycol and dry it out, after which feed. Be careful to keep your chickens on perfectly clean ground. Do not on any account run them where worms have been known to infect them. The above remedy has been found to be a certain cure if used properly.

Best Egg-producing Strain of Fowl.

Worcester.—What are the best fowls for a farm where they run wild? Do you recommend Plymouth Rocks for egg-production?

The Principal, Elsenburg School of Agriculture, replies: I would not advise you to take Barred Plymouth Rocks for purely egg-production. White Leghorn, Black Leghorn, Minorcas, or Anconas are purely egg-producing breeds. If you want a breed for fairly good egg-production, and table use also, then take White Plymouth Rocks, Australian Black Orpington, or Rhode Island Reds.

Peach Leaf Curl.

Malmesbury.—Can you recommend an effective remedy for "peach leaf curl." Is this "leaf curl" due to a fungous growth?

The Principal, Elsenburg School of Agriculture, replies: As you suggest, the "leaf curl" seen in spring is due to a fungous growth. The treatment for the prevention of this disease consists in:—

(*a*) *Winter washing* with copper sulphate at the rate of 1 lb. copper sulphate to 25 gallons water; or use lime sulphur (e.g. Capex) at the rate of 1 part in 10 parts water. This spraying should be applied as late in winter as possible, when the buds are swelling, but before they actually burst. If done thoroughly, this single treatment will check the disease to a very large extent.

(*b*) *Summer spray*, if necessary, with dilute bordeaux mixture of the 4-4-100 strength. Two or three sprayings at intervals of ten days should be sufficient.

The Construction of a Pit Silo.

George, Cape Province.—Will you please inform me how a pit silo is made? Does the silo require lining?

The Principal, Elsenburg School of Agriculture, replies: The pit silo is usually made rectangular, and should not exceed 8 or 9 ft. in depth. If the soil is still, it need not be lined, and it is a good plan to leave a stairway in the natural earth at one corner to facilitate the emptying of the silo. The floor is simply the solid ground. To prevent seepage a suitable site must be selected, and a catch-water ditch around the upper side of the pit is desirable. If the pit is to be made in loose soil, a lining of brick, stone, or corrugated-iron may be used. Several small pits are preferable to one large one. A pit 25 feet long, 15 feet wide, and 8 feet deep, containing 300 cubic feet, would hold about 55 tons of silage. The pit is filled about a foot above ground-level and allowed to settle for a day or two. It is then covered with a layer of soil about a foot deep to give the necessary pressure and to exclude air.

Book-keeping.

Estcourt, Natal.—I bought weaner pigs. I debit pig account with the value of the twelve purchased. Four died. What am I to do with the four dead?

The Principal, Glen School of Agriculture, replies: In reply to your query concerning the method of recording the loss by death of the pigs, beyond making an entry in your diary and in your record of the number of live stock, nothing need be done. The valuation at the beginning and end of the period covered by your books, taken in conjunction with the record of sales and purchases and expenses on feeding stuffs, wages, etc., will show the profit or loss during the period concerned, and the loss by death of the four pigs will be reflected in the profit or loss shown in the account.

See "Farm and Estate Book-keeping," by Herbert Taylor.

Winter Ploughing.

North-West Orange Free State.—What advantage is there in winter ploughing?

The Principal, Glen School of Agriculture, replies: There is not one advantage, but many. Usually on South African farms where maize is grown to any extent the area under this crop is limited by the amount of land which can be ploughed and planted after the spring rains. If the land is ploughed in the winter much of it need only be disked or harrowed prior to planting, and consequently it will be possible to get a much larger area planted at the proper time. Not only does winter ploughing make an extension of area possible, but it also improves the yield. Moisture is the commonest limiting factor in crop production in South Africa, and any method which will increase the water supply to the plant should be adopted. Ploughing the land in the spring after the rains brings about great loss of moisture badly needed, it being common knowledge that freshly ploughed land dries more rapidly than land undisturbed or disturbed to a depth of one or two inches only. Moreover, winter ploughing serves to increase the proportion of rainfall absorbed and to lessen the run off. Experience also shows that winter ploughing serves to lessen the attacks of various insect pests, particularly stalk-borer. Finally, the turning over of the land in winter has a beneficial effect on the biological condition of the soil, and should also assist in rendering available plant food in the soil.

Whatever the argument and theory may be, the fact remains that winter ploughing increases the crop yield, and is now being practised by the most successful and progressive farmers all over the country.

Read the article appearing in the May, 1922, number of the *Journal* on "Causes of High Cost of Production of Maize and the Remedy."

Potato Fertilizer.

Bethal.—Last year I made up for my potatoes a mixture to the ton—1000 lb. superphosphate, 400 lb. bone, 400 lb. guano, and 200 lb. potash. The soil was of a sandy loam type, the crop answering very badly. In my opinion the mixture was not in the right proportion. I am sending two soil samples from this land for analysis, and I want you to tell me what is necessary and how the mixtures could have been better balanced. Maize following the potato crop for two years yields about fifteen bags per acre. This crop is not fertilized.

The Principal, School of Agriculture, Potchefstroom, replies: Your potato fertilizer is quite well proportioned, but you do not mention at what rate you applied it; 400 lb. per acre would be sufficient. I do not think that soil analysis will help your case in the slightest. You have supplied everything the potato requires except organic matter. If you add two to four tons of manure in addition, I think you will notice a big difference. The low yield may also have been due to disease or insufficiency of moisture.

Lime Unnecessary for Maize and Potatoes.

Standerton.—Please send me instructions how to take a soil sample which I wish analysed. I think my soil is sour, and I want to know how much lime to put on my mealie and potato lands.

The Research Chemist, Potchefstroom, replies: It is not necessary to lime land for these crops, so it will not be necessary to do a soil analysis. If you think your soil is deficient in something, it is no doubt phosphates. Try superphosphate at the rate of 200 lb. per acre for your mealies and 400 lb. per acre for potatoes. Give the potatoes, in addition, plenty of kraal manure, and you might also try the addition of 100 lb. of sulphate of potash. Lime does not pay for all crops. Read the article appearing in the Department's *Journal* for February, 1922, entitled "The Lime Requirement of Soil and Plant," by Thos D. Hall.

Seed of Kikuyu Grass.

Albany, Cape.—Can you tell me where I can procure seed of kikuyu? I have a small plot of the grass on my farm, but, though it has been well established for about three years, it has never flowered. I wish to put down a couple of acres to it, and should be glad if you could let me know where I can procure seed for the purpose.

The Chief, Division of Botany, replies: Kikuyu grass usually flowers very regularly, but the inflorescences are short and hidden between the leaf sheaths and the culms (hence its botanical name *Pennisetum clandestinum*), and only the feathery stigmas are exserted, which close examination of the plant will reveal. Kikuyu, however, never (as far as we know) sets seed; even in its native habitat of East Africa it relies for propagation entirely on its runners.

Crown Gall.

Johannesburg.—I shall be glad if you will kindly inform me of the nature of the peculiar growth (specimen enclosed) which is attacking willow trees. It is doing considerable harm to these very graceful trees.

The Chief, Division of Botany, replies: The willow twig submitted is infected with crown gall, due to the organism *Bacterium tumefaciens.* Willow trees are very susceptible to crown gall and form a fruitful source of infection for fruit trees in their neighbourhood. Infected willow trees near an orchard of stone fruit trees have been known to cause a serious infestation with crown gall. Read the article on crown gall which appeared in the *Journal* for July, 1921.

Ring Blotch of Citrus Leaves.

Waterberg, Transvaal.—I am enclosing some navel orange leaves, and shall be glad if you can tell me what is the matter with my trees. On a great many of them the leaves are like the enclosed; both old and young leaves show the circular yellow spots, and they are dropping off. Kindly let me know the remedy, if any.

The Chief, Division of Botany, replies: The citrus leaves submitted are affected with the disease known as "ring blotch" or "concentric leaf mottling." This is not due to any fungus or other parasitic organism; the cause is obscure, but is probably correlated with soil conditions. You will find that regular and systematic green manuring with velvet beans or cow-peas will greatly improve the condition of the trees.

"Hajira" Seed Oats.

Pretoria.—Please be good enough to enlighten me upon th matter of "Hajira" seed oats, the best time for sowing, quantity acre, and if the variety has any advantage over Algerian Sidonian.

The Division of Agronomy replies: Some cerealists say that "Hajira" and "Sidonian" oats are similar strains. Experiments, however, have proved that "Hajira," besides having very strong rust-resistant qualities, is often used as a summer crop, possessing a higher (straw) feeding value than any other known variety. Sow at the rate of 60 lb. per acre.

Cango Yellow Flint Maize.

Val, Transvaal.—Please identify the maize sample submitted and advise me of its qualities.

The Division of Agronomy replies: The sample is the "Cango Yellow Flint Maize." It is a medium-early variety; takes between 115 to 120 days to mature; a fairly good yielder in areas where the growing season is short, and rains not too regular. It is also good as a green mealie, and for fodder and silage purposes. The variety is also known, I believe, as Yellow Botman. The berries are slightly compressed, shallow and hard, and are rounded at the apex. Colour of the grain, golden yellow; cob, thin and white; rows on cob, twelve. Very highly recommended for export.

Read the *Journal*! It acts as a link between you and the Department of Agriculture, which is charged with the furtherance of your interests. It publishes information for the most part of an official nature not otherwise readily accessible. An index will be sent you every six months, so keep the *Journal*. It will prove useful as a book of reference.

THE POULTRY YARD MONTH BY MONTH.

August.

By J. J. JORDAAN, Lecturer and Instructor in Poultry, School of Agriculture, Glen, Orange Free State.

Feeding.—This is one of the most difficult months of the year in which to obtain green food for poultry, and yet it is questionable if there is a time when it is more important. The breeding stock require it so as to give the maximum egg production which is so much desired to keep the incubators going. Chickens that were early hatched, and from which it is hoped to select next year's show winners, must be kept growing, therefore green food is most necessary now for this purpose. Vegetable tops of most sorts may be used, especially if boiled up and mixed in the morning mash. Dry lucerne meal or hay chopped up fine and soaked overnight in water makes a good substitute for the fresh green article. Spineless cactus or sprouted grains to some extent may be resorted to. Green barley or cabbage is excellent.

Chickens.—Start separating the sexes to ensure the best growth. Cull strictly. The cockerels that do not warrant their being sold as breeding birds next year should be put in a run by themselves and fed upon foods such as mealie meal porridge, skimmed milk and crushed oats, equal parts, mixed to a stiff consistency, to get them into condition for the Christmas trade. The best birds can then be given more and better attention, which will enhance their price later as breeding birds. When catching the birds in culling, examine for insects the bare parts of their bodies under the wings, around the vent, and on the heads, which, if any insects are seen, should be applied with salad oil, lard, etc. Do not, however, use paraffin, although a fraction of this mixed with the fat is excellent. This must be used with scrupulous care, for the result of too much paraffin is often fatal; but no harm can be done by using fat, lard, sweet or salad oil alone, and each is effective. In early hatched cockerels leg weakness may be expected, and rheumatism may make its appearance; for the former feed liberally crushed oats in the mash and add one tablespoonful heaped up of bonemeal in the mash daily for each ten birds. A similar quantity of Parrish's chemical food in each quart of the drinking water will also be found beneficial.

Disease.—Rheumatism can be distinguished from leg weakness by the joints in most cases being swollen, inflamed, and hot to the touch. In such event look for the cause—draughty, cold houses, sleeping on the floor, incorrect feeding—and remove it. Give each sick bird a teaspoonful of epsom salts in some warm water, and a dry, warm sleeping coop or quarters well littered with hay or chaff. Give it soft nourishing food, and each night 1-grain pill asperin, painting the joints affected with iodine. Eye roup, ordinary roup, and diphtheric roup may also be expected in some cases. Cleanliness and warm sleeping quarters, but not crowded, will help to keep these down if previously present. Eye roup is mostly due to a germ and draughty houses. To effect a cure, gently press mucus out of the bird's nostrils, then wash the face with a weak solution of sulphate of copper or permanganate of potash solution, daily painting around the eye with iodine and dropping into it one or two drops of balsam sulphuris. Ordinary roup is very infectious, and in most cases hereditary or due to overcrowding, starting with an ordinary cold and developing in stages until it is true roup. Watch the birds after they have had their bran mash, and those seen with bran adhering to their nostrils an hour or so later should be caught, and if the nostrils are pressed and the bran removed, the smell of the fingers will indicate whether it is only a cold or roup by the vile smell the latter has. Remove the cause, and it is best to destroy the bird, but if a cure is attempted, wash the head, face, and mouth thoroughly with a weak solution of sulphate of copper, and spray with a small machine oil-can a few drops of the following mixture into each nostril daily until better: 1 tablespoonful paraffin, 4-6 drops eucalyptus oil, 4-6 creosote. Birds with diphtheric roup should be at once destroyed, burned or buried.

In all cases of disease thoroughly clean and disinfect the sleeping quarters and food and drink receptacles, and isolate sick fowls at once; see that they sleep warmly, and feed only on soft nourishing foods.

Breeding Pens.—The number of hens in the breeding pens may be increased 25 per cent. if fertility has been good. Get all the eggs possible in incubators or under hens of the heavy breed varieties, and start this month to hatch light breed varieties.

Windbreaks.—Windbreaks or screens should be made to enable the birds to obtain shelter from the prevailing wind this month, especially as young stock, unless they have protection of this kind, will not thrive, and laying hens will not produce as heavily as they would do if in comfort.

Insects.—Dip all fowls in a commercial carbolic dip made according to directions, and do this regularly each month from now onwards so as to keep down insects. The houses, nests, brooders, etc., should also be sprayed regularly with a strong solution of dip to ward off disease and keep insects in check; if the houses are first painted with solignum or carbolineum, it will help greatly, as well as preserve the woodwork of the house. Whitewash the roofs of the houses with a fairly thick whitewash to which has been added a liberal amount of coarse salt.

NOTES FROM THE "GAZETTE.'

Attention is drawn to the following matters of interest which appeared in the *Union Government Gazette*:—

(Abbreviations: "Proc."—Proclamation; "G.N."—Government Notice.)

Gazette. No.	Date.	*Item.*
1242	16/6/22	In connection with the advances made by the Government for the erection of certain dividing fences in the Division of Vryburg, an annual levy of 5s. has been ordered to be collected from each adult male inhabitant concerned for the years 1922 to 1925 inclusive. (Proc. No. 93.)
		Dr. H. H. Green and Dr. J. F. van Zyl have been designated Analysts of Pest Remedies, in terms of the Fertilizers, Farm Foods, Seeds, and Pest Remedies Act, as from 2nd June, 1922. (G.N. No. 938.)
		For purposes of the Scab Regulations, a portion of the Ward Lower River Zonderend, Caledon District, has been declared a protected area. (G.N. No. 942.) All sheep and goats, with the exception of those coming from protected and semi-protected areas, entering the District of Beaufort West will be subject to the permit and dipping restrictions of the Scab Regulations. (G.N. No. 943.) The Hoopstad District, with the exception of two farms, and a certain portion of the adjoining District of Boshof have been declared protected areas. (G.N. No. 965.)
1242 1244 1245 1247	16/6/22 22/6/22 30/6/22 7/7/22	The disinfection and dipping of cattle required by the Stock Disease Regulations have been ordered as follows: (*a*) Every five days in the five-day dip for portions of Bergville, Babanango, Vryheid, Ngotshe, Paulpietersburg, Camperdown, Piet Retief, Nqutu, Umvoti, Lower Tugela, Weenen, Richmond, Impendhle; (*b*) every seven days in the seven-day dip for portions of Carolina and Lydenburg. (G.N. Nos. 948, 955, 987, 1025, 1064.)
1242	16/6/22	The compulsory branding of cattle in a distinctive manner with a registered brand has been ordered for all cattle on various farms in the District of Carolina to be completed within sixty days from 13th June, 1922. (G.N. No. 953.)
		Under the Fertilizers Act, the minimum content in basic slag of phosphoric oxide soluble in citric acid has been fixed at 10 per cent. instead of 12 per cent. (G.N. No. 968.)
1247	7/7/22	Various lots of Crown lands in the Field Cornetcy of Achter Paarl will be sold by public auction at Klapmuts on the 23rd August. (G.N. No. 805.)

RECENT AGRICULTURAL LITERATURE.

SELECTED LIST OF BOOKS ADDED TO THE DEPARTMENT'S LIBRARY

[NOTE —The first number is that of the class to which the book belongs, the last number is that of the book itself]

AGRICULTURE, LIVE STOCK ETC

400 Huss, B A Textbook on Agriculture Ill , 8vo, pages 168 London 1921 Longmans, Green & Co No 8166

400 Wilkins, V E Ministry of Agriculture and Fisheries Agricultural Research and the Farmer 8vo pages 168 London, 1922 His Majesty's Stationery Office No 8169

462 Clark, G H , and Malte, M O Fodder and Pasture Plants Ill 8vo, pages 143 Department of Agriculture, Dominion of Canada No 8168

467 Percival, J The Wheat Plant Ill , 8vo, pages 463 London Duckworth & Co No 8156

472 Gardner, V R , Bradford, F C and Hooker, H D The Fundamentals of Fruit Production Ill , 8vo, pages 686 New York 1922 McGraw-Hill Book Company No 8167

SCIENCE (GENERAL)

540 1 Prager B , and Jacobson P Beilsteins Handbuch der Organischen Chemie (Vierte auflage vierter Band) 8vo pages 734 Berlin, 1922 Julius Springer No 8155

CITRUS CANKER ERADICATION.

INSPECTION WORK, JUNE, 1922

Farms Inspected—

Rustenburg District (Hex River Ward) —Buffelspoort No 668, Kromrivier No 590 Groenkloof No 418, Kafferskraal No 915 Boschfontein No 193, Riettontein No 606, Modderfontein No 247

Waterberg District (Nylstroom Ward) —Roodepoort No 2148, Zandfontein

Pretoria District (Crocodile River Ward) —De Kroon No 420

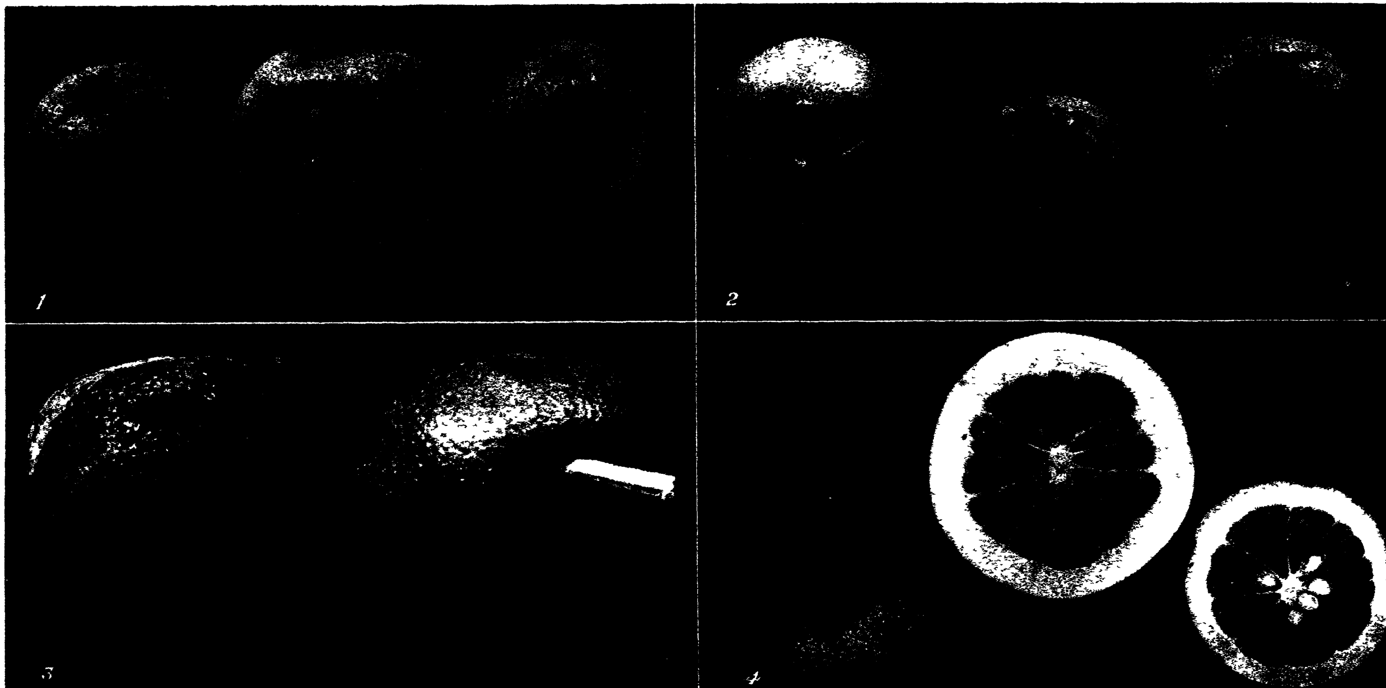
Fresh Infections—Nil

Fresh Outbreaks—Nil

Total Number Inspected—

Nursery trees, 19,877 trees other than nursery inspected, 6311 Trees found infected, nil

Number of inspectors engaged, 21



CITRUS EXPORT.—SOME DEFECTS.

Fig. 1.—Long Stalks. Fig. 2.—Malformed Navels. Fig.—3. Injury in Packing and Natural Blemish.

Fig. 4.—Thick-skinned Grapefruit (centre) and Abnormal Orange.

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Applications, with subscriptions, to be sent to the Government Printer, Pretoria.

NOTES.

The Locust Invasion of 1921-22.

The report of the Officer-in-Charge of Locust Administration, Mr. R. H. Williams, on the 1921-22 campaign, is published in this number of the *Journal*. It outlines the work carried out in combating the locust invasion of the past season, the severest for many years and a consequence of the great drought of 1919. Fortunately, the devastation was not as serious as it could otherwise have been, for in many cases the season's crops had ripened too far to be damaged by the locust, and, in addition, by means of the intelligence system in vogue it was possible to give farmers timely warning of the approach of the swarm in order to enable them to reap their crops betimes. As to the future, it is anticipated that, given favourable hatching conditions, there will be a widespread infestation again next season, though its venue may vary somewhat from that of the past outbreak. In some of the Cape districts, heavily infested last season, it is reported that no egg-laying has taken place, and it is possible that they may escape. But there is every likelihood that the flying swarms from the Kalihari that invaded the western and northern Transvaal districts have deposited eggs there, and organization is proceeding apace for the extension of the campaign to those parts. The Department depends on the co-operation of farmers in their fight with the pest, and it is gratifying to state that in no previous campaign have they assisted the officers of the Department so readily and well as in the past one. Therefore, although next season's infestation may be as intense and widespread as the one just passed, Mr. Williams is confident that, with the adoption of the farmers' circle system and the loyal assistance of the farmer generally, the organization now in existence will be able to cope with the situation.

The Life-history and Extermination of the Jackal.

The sinister figure of the jackal throws over the country a shadow that deepens with time, for the presence of this animal in South Africa has been largely responsible for setting in motion a train of consequences that to-day are seen in the deterioration of the veld and the rapid erosion and dissipation of that irreplaceable asset—the soil of the Union. The present system of small stock farming that the Commission* presently investigating the drought problem inveighs so strongly against, owes its inception and continuance largely to the jackal in the heavy losses he is capable of inflicting on unprotected animals. And to bring about the improved system earnestly advocated by the Commission, if the processes predicted to lead to the eventual disaster of the country are to be stayed, one of the first steps is the removal of the jackal. It is a problem that has exercised the farmer for a hundred years, and notwithstanding all his ingenuity and resource in combating it, the jackal remains an unconquered pest.

The Commission referred to comes to the only logical conclusion that the jackal must be brought under control and, if possible, exterminated; and that little permanent success will attend the efforts to destroy it in any district unless it be first pinned down to an area which will permit of its being eradicated rather than driven away. It was found that there was much difference of opinion throughout the country as to the best method by which the jackal can be exterminated, but the Commission considers that nothing is more calculated to lead to this end than jackal-proof fencing.

The problem is a national one, and for some time past has been investigated by the South African Biological Society, which has circulated a list of questions throughout the country in order to accumulate as much information as possible on the life-history of the jackal before taking active steps in connection with its extermination. The inquiry met with a gratifying response, and there is published in this number of the *Journal* an article, based on the replies received, written by Mr. Roberts, of the Transvaal Museum. It is entitled "The Life-history of the Jackal," and though valuable as a forerunner, is not yet complete; and as it is the most important part of the investigation further particulars are still wanted regarding the various methods practised in overcoming the pest, in the acquiring of which the co-operation of the farmer again is sought. While therefore the present article gives a valuable account of the life-history of the jackal, its habitat, movements, breeding and other habits, diet, mode of attack, etc., it closes with a request to farmers for additional information, on lines set out, respecting hunting, fencing, poisoning, trapping, shooting, and destruction of jackals in holes.

Replies may be sent to this office or addressed to Dr. Phillips, Honorary Secretary, S.A. Biological Society, P.O. Box 820, Pretoria, and the Department trusts that the efforts to assist them will widely and promptly be responded to by farmers. The importance of determinedly tackling and overcoming the problem can not be impressed

* Interim Report of the Drought Investigation Commission. Obtainable from the Government Printer, Pretoria. Price 2s. See also article "The Great Drought Problem," in last month's issue of the *Journal*; page 118.

too strongly. It is emphasized in the following extract from the report of the Commission already referred to:—

"Your Commission recognizes that there are those who will consider any measure of compulsion with reference to the jackal irksome; but the benefits which will flow to both State and farmer as a result of the extermination of the jackal, far outweigh any inconvenience to which the farmer may be put. To the farmer the extermination of the jackal means large savings in the cost of herding his flocks; more and better wool; a greater freedom from stock disease and attacks by insect pests; greater protection from scab; and an increased capacity of the farm to carry stock. To the State the extermination of the jackal means that the destruction of the vegetal covering of the country and soil erosion will cease, in so far as the kraaling of stock is responsible; that it will be possible to introduce the paddock system of farming, and through that bring about the restoration of the veld, which at the present time is in the process of ruination."

This statement should induce every farmer in the affected parts to contribute his share (however meagre it may be) to the accumulated data from which the best methods of ridding a dangerous menace to the State may be devised.

Tree-planting and Soil Fertility.

There is no more commendable practice than that of tree-planting, particularly in a country such as ours, and the planting of belts and clumps of trees providing shade and shelter for the farm animals that is being carried out at present in Natal and other parts of the Union could be widely extended with benefit to man and beast. In connection with this practice, Mr. Williams, the Chemist at the Cedara School of Agriculture, draws attention to a noticeable feature: it is found that, as a rule, the soil contiguous to these trees, up to a maximum distance roughly of 20 yards, is apparently infertile, for little in the way of crops will grow there, such growth as there is improving progressively with distance from the trees until they attain normality at the limit of the area. There are several causes that are given for the unprofitable state of this zone, and they are discussed by Mr. Williams in an article appearing in this number of the *Journal* entitled "Apparent Infertility of the Soil around Trees." The matter has been the subject of experiments at Cedara, and they go to show that the scientific contention that the main reason for the barrenness of the land in proximity to a plantation is the deprivation of the trees of the moisture of the soil through which their roots range, appears well founded. The deep-rooted trees are able to obtain their moisture at a considerable depth in the sub-soil, but this would deplete the underground supply of water so as to prevent a sufficient amount being drawn up to near the surface by capillary action for the needs of the neighbouring shallow-rooted crop. It has been found in California that the blue-gum, which has been largely used for windbreaks, has this effect on to the soil to a distance of about 30 feet on either side, and that on that account the pine and cypress have recently supplanted the gum, for their narrow type of leaf conduces to a minimum amount of transpiration and loss of soil moisture as opposed to the action of the broad leaf of the gum.

The Packing of South African Fruit.

The Department constantly impresses upon fruit growers the importance of marketing their produce in accordance with the methods advocated by its officers, and publishes official reports from oversea regarding the condition of fruit shipments on arrival, pointing out where defects may be remedied. The lessons of the past have been well applied, for among the exporters of South African fruit there are to-day those whose packing is unsurpassed by any of their competitors on the world's market. But there are others who have much to learn, and how their lack of experience or carelessness results in loss to themselves and dissatisfaction to the fruit traders is graphically told in a contribution to the *Cape Times* of the 8th July last. It describes the all-embracing nature of Covent Garden, London, the great market where fruit from many parts of the world is gathered in competition: it relates how the abundance of attractively arrayed fruits impresses, more than any other, the outstanding truth that the deciding factor in the great fight for supremacy is that of packing. The opinion is prevalent oversea that no fruit in the world can compare with ours, but this natural advantage is easily lost if it only is relied upon, for, as the writer states, the only conclusion that was possible is that the future is with the best packers. He proceeds to describe the condition in which he found some of our fruit: there was, for instance, a large consignment of pines, the average of those saleable working out at less than one a box. They varied in size, and their condition almost defied description, some being quite green and others covered with mould. Here and there were some excellent pines which met a ready sale, but the consignment as a whole was a dismal failure. On the other hand, he found in splendid condition consignments of pears, from the western districts of the Cape, that had already been in a dealer's cool chamber for a month, an example of what good packing, and picking at the right time, could produce. Fruit of this condition, it was stated, could be disposed of at the rate of 50,000 cases per week. Another dealer, referring to a South African firm, stated: "They are without exception the finest packers in the world. Their fruit is good, but their packing is superb. When their stuff comes to hand we just put up a notice, and within an hour or so it is all sold, although their fruit—apples—has to face the biggest competition of all."

On a market, therefore, where compete not only the growers of South Africa, but where Tasmania, New Zealand, and Australia send their shiploads of apples, and the cherries and oranges from France, the Azores and Spain add to the competition, which is swelled again from many other sources, it is imperative that our fruit should attract and not repel. "Some of your packing," said a prominent authority, "is the best I have ever seen, but you spoil the market by the variableness of the quality and the sloppy methods of packing that many adopt." "The marketing of produce," the writer of the article points out, "is a matter every bit as important in agriculture as production itself. The packing of fruit, correctly graded, uniformly selected, with full precautionary methods as to its condition at the time of plucking and packing, is just as important as the production of the fruit itself. In fact, if these are not efficiently carried out, then it would be far better to cut out the

exportation of fruit, and admit that through lack of thoroughness, South African fruit growers relinquished their hold on the trade of the world."

It is not the privilege of every grower to see his fruit displayed for sale oversea, but if he would endeavour to picture the deteriorated article turned out for competition with the world's choicest products, he cannot fail to understand the poor prices sometimes received.

Protection against Hail: The Parahail.

In 1899 there was introduced into France by the Comte de Beauchamp and General de Negrier a device that is now widely known as the electric "Parahail." It is, in reality, a gigantic lightning conductor, to which the name of "Electric Niagara" has also been given, as indicating the great quantity of electricity it can cause to be discharged into the atmosphere. The object is to neutralize the electricity of the hail-cloud which, according to the theory of the inventors, is dangerous only on account of its high electric potential, the belief being that if, by means of this perfected lightning conductor, the potential of the hailstorm, which is charged with positive electricity, can be sufficiently lowered by the efflux of the negative electricity of the soil, the hail will either be dissolved and fall as rain or become so soft as to cause no damage.

In South Africa, where parts of the country are subject to devastating hailstorms, the French device has naturally created considerable interest, and the Department is frequently approached for information regarding the efficacy of the parahail as a protection for life and crops against hail and lightning. The latest information on the subject has just come to hand from the Director of the National Meteorological Office, Paris, who gives the conclusions arrived at by M. Courty, Astronomer to the Observatory at Bordeaux. After a very complete study of the question, M. Courty writes: "If the parahails have exercised on these points (the posts established since 1912 in the department of Gironde and, since 1914, in that of Dordogne) any beneficial influence whatever, it must be admitted that it is feeble, and I believe one would have little difficulty in finding an equal number of unprotected stations where hail has not caused any more damage during the same period."

M. Courty considers that the experiments with the parahails should be continued for several years longer, and gives the following opinion: "Parahails in general are by no means hurtful, very far from that; if their efficacy as protectors against hail may still be contested, they possess at least the indisputable advantage of being lightning protectors of the most perfect type, and no serious-minded person can possibly believe that they attract hail." The study of hailstorms in his area carried out by M. Courty during 1918, leads him to the following conclusions: "These facts confirm the conclusions drawn last year from the experiments of the five preceding years relative to the protective rôle of the parahails. They are exclusively—we have said and we repeat—excellent lightning conductors. As for their hail-protecting value, it seems pretty certain that it is practically nil."

An Investigation into the Egg Export Trade.

Last season there were exported from the Union to London 43,636 cases of eggs from Capetown and 11,514 cases from Durban, and serious complaints arose regarding the condition of certain of the Durban consignments. The contents of some, it was stated, were badly broken owing to the cases being too big, many eggs were old, numbers contained spots and blacks, the size was variable, and topping had been resorted to. The Minister of Agriculture appointed a Committee to inquire into the matter, and their report* has recently been published. It deals largely with the conditions prevailing at the two ports in connection with the inspection of the eggs prior to export, and of the difficulties which had to be contended with last season, especially at Durban, when large quantities came forward for inspection. That there was an inadequacy of facilities for handling the trade as satisfactorily as needed is clear, but that some exporters had not mastered the essentials of an enduring trade is also apparent from the following statement of the Committee, viz.: " . . . the exporter seems unable at times to perceive that his real and abiding interest does not lie in the possibility of an immediate gain despite inferior export, but in the stable position he can secure in the market oversea, and this is only to be acquired if he accustoms himself to put up consignments for export conforming in all respects to the standards required. If his view of his own interests inclines him to regard the position differently, he must be constrained to think otherwise in the interest of his country, and he will have to realize that this particular trade will be closed to him unless his outlook improves."

The Committee has made several recommendations for the future control of the egg export trade, the main essential being the competent and effective grading of the eggs, not only at the hands of the Government inspectors, but also by the exporters themselves before the consignments are packed. Grading is all important. For this purpose it is proposed that at every exporter's warehouse there should be employed at least one person competent to grade eggs, and that the premises be subject to Government inspection. This would materially assist in the final examination of the eggs by the Government inspectors prior to export. The appointment of a chief poultry officer, together with a qualified poultryman to be resident, one at Durban and one at Capetown, is recommended, and the regulations were revised by the Committee according to what it considered would best serve the interests of the industry. Among other things this revision precluded the export of eggs below the weight of 1¾ oz. (but the Committee was not unanimous on this point): increased the number of cases to be examined by the inspector to 10 per cent.: provided for a levy of 1s. per case exported: and permitted the repacking of rejected consignments subject to certain conditions. It may be mentioned that new regulations governing the export of eggs have now been published (Government Notice No. 1202, 1922) and have effect from the 1st August, 1922. They bear the imprint of the Committee's investigations in several respects; the small egg, however, is not debarred from export.

The economic side of the subject was also referred to, particularly in the light of the Committee's anticipation that oversea prices for

* "Report of an Egg Export Enquiry." [U.G. No. 23, 1922.] Obtainable from the Government Printer. Price 1s. 9d.

South African eggs will drop in view of the increasing competition from other parts of the world that may be expected with a return to normal trade conditions as the disturbances caused by the war subside. It points to the need for organizing the trade in such a manner as to reduce overhead charges, and refers in this connection to the important matter of railway and sea freights.

Poultrymen throughout the country will find much that is useful in the Committee's report, and those interested in the export trade are reminded also that a bulletin (No. L.S. 42) written by the late Mr. W. O. John, and entitled "The Handling, Packing, Storage, and Transport of Eggs," is obtainable on application to this office.*

An Oversea Market for Beans.

Requests having been made to the Department to ascertain whether oversea competition would permit the profitable export of beans from the Union, inquiries were accordingly instituted, and the Trade Commissioner, London, states that, except in the best varieties of white haricots and butter-beans, there is very little likelihood at present of business being done in South African beans on the English or Continental markets. For the varieties named there exists a demand, provided they can compete with the quality of these beans from Rangoon and Madagascar. The demand, however, is generally very restricted as the consumption is not large, although in the winter time there is a certain quantity sold for human food, and to meet this beans from South Africa should be shipped during the months of September and October.

The Madagascar butter-bean is the quality favoured by the English market, and if the crop in that country is a good one, the yield is generally able to supply the demand. On the other hand, for the haricot description of bean those from Rangoon are well known on the market and sell fairly freely for human food.

Coloured beans are of no use for the United Kingdom, unless they can be sold at a price to compete with animal feeding stuffs, the sole use to which such beans are put. On the Continent also they would be very difficult, if not impossible, to sell, unless the price was very low.

A London firm well known in the trade states that in their experience African grown beans are very difficult to sell: this they found even during the war when there was a shortage of all feeding-stuffs. On the Continent, they believe, there is rather a better demand (the Commissioner for Commerce at Rotterdam, Mr. Spilhaus, is now inquiring into the matter), but all classes of beans for edible purposes have been difficult to sell this year, and there were still (July) considerable stocks in London of Rangoon (haricot) beans which were not worth more than £6. 15s. per ton for handpicked, fair average quality, of last crop, while the Madagascar butter-bean, which meets with the readiest sale, was traded in during the past few months at from £12 to £17 per ton, *ex* store, according to sample. The use of beans, the firm referred to comments, seems to have dropped away very much, and no doubt the quantity of this class of dried food which had to be used during the war when fresh vegetables were so scarce, has caused the public to revert to the latter wherever possible.

* Price 1d. prepaid.

A Sire of Good Milk Strain for the Dairy Herd.

The effect of a sire of good milk strain on his progeny is borne out by the Ayrshire dairy herd at the School of Agriculture and Experiment Station, Potchefstroom. The sire, in the present instance, is the bull South Craig Rentpayer. The lactation periods, milk yields, and total butter-fat content for his progeny, as heifers, compared with those of their dams, also as heifers, show a marked and in some instances a very remarkable improvement over the dams. As an example, Cow No. 127 shows a lactation period of 276 days, against 248 days for the dam, the milk yields for these periods being 5243 lb. and 3277 lb. respectively, whereas the total butter-fat yields in pounds were 225.8 and 134.1. Cow No. 128 improved her lactation period over that of her dam by 248 days to 196, the total milk yields by 4151 lb. to 2627 lb., and the butter-fat content by 156.4 lb. to 110.7 lb. In the case of Cow No. 129, with a shorter lactation period of 304 days, as against 330 days for the dam, she nevertheless yielded during the lesser period 5638 lb. of milk, against 5761 lb. for the dam with the longer lactation period. As a final example, Cow No. 125 yielded 4987 lb. of milk with a total butter-fat content of 197.8 lb. in 281 days, against 5064 lb. milk, with a total butter-fat content of 202.9 lb. during 328 days for the dam.

Results like those enumerated above form an eloquent appeal to those interested in the grading up of their dairy herds to procure only the very best stock money can buy in the way of good sires, and, with this ideal before them, dairy farmers will, as a natural course, rigidly avoid also the inferior and scrub cow.

The Control of Codling-moth.

Codling-moth is undoubtedly the worst pest of pears and apples in South Africa, causing considerable damage in some orchards, where 25 per cent. or more of the harvest during seasons of good crops have contained wormy fruits. Such loss, however, is avoidable, for by carrying out proper methods of control it can be greatly minimized, so that in seasons of normal crops 85 per cent. to 93 per cent. of the fruits can be rendered free from codling-moth. In an article that appeared in the October, 1921, issue of the *Journal*, Dr. Pettey, the Entomologist at the Elsenburg School of Agriculture, pointed out very clearly how the pest could be controlled by careful and thorough spraying, correctly timed, and composed of the right materials of the correct strength. To the present issue, he contributes a further article dealing with a simple device, easily constructed, by means of which larvae leaving infested fruit are captured, and the great number of moths that would otherwise have eventually found their way to the adjacent orchard, considerably reduced. Many owners of large orchards who have carried out the Department's advice in regard to spraying, state that, notwithstanding, codling-moth infestation has increased alarmingly in recent years, and Dr. Pettey, who has given the problem much study, states that the longer his experience the more he is convinced that fruit growers must adopt those measures of control supplementary to spraying referred to in the articles above mentioned, chiefly because native sprayers cannot be relied upon to spray efficiently.

Pise-de-terre: The Cheap Construction of Farm Buildings.

Farm buildings to house animals, implements, produce, etc., as well as those for human occupation, are essentials in good farming practice, but the great increase in the cost of building materials and of labour during the war, and its continuing high level, have confronted many farmers with the alternatives of either suspending building construction wherever possible until prices are within their means or of turning to a form of construction less costly than what they would ordinarily employ. It was with a view, therefore, to assist farmers in the latter direction that an article was published in the April, 1922, issue of the *Journal* on pise-de-terre, a system of building by means of compressed earth, and one that has come down through the centuries as a cheap, yet efficient, form of construction. Those who wish to employ this system, and with it the materials and labour at hand on the farm, should read the article, together with the one published elsewhere in this issue. Both are written by Mr. Aird, the Engineer of the School of Agriculture, Cedara, and the latter (by means of illustrations and a set of the questions usually made by prospective constructors and the replies thereto) gives additional information that should prove useful; it includes also a general specification of a pise-de-terre building. While the scheme is simple, its success depends chiefly on suitable soil and shuttering and proper workmanship. These are carefully discussed by Mr. Aird. Where difficulties are met or doubt exists, however, in regard to any points connected with the construction of these pise-de-terre buildings, farmers are invited to apply for advice to the School of Agriculture serving the area in which they are resident.

Nagana and the Tartar Emetic Solution.

Investigations into the disease known as Nagana, which is enzootic in areas of Zululand, where the tsetse fly is found, are being prosecuted by the Department. Reference is made in this issue of the *Journal* to the progress of the investigations of Mr. Harris, of the Division of Entomology, into the life-history, etc., of the tsetse fly, while last month a report was published regarding the work done by Mr. Curson, the Veterinary Research Officer, who was sent to Zululand in April, 1921, and is still engaged in investigating Nagana in cattle and other domestic animals. Realizing that a specific for the disease was not available, a form of palliative treatment was decided upon, and after preliminary tests, Mr. Curson instituted the tartar emetic treatment. This method of dealing with the disease is described by Mr. Curson in an article published elsewhere in this issue, as well as the symptoms and course of Nagana. As far as our present knowledge goes, Mr. Curson recommends this treatment for several reasons. The materials are easily and cheaply procured, and in reliable hands can safely be administered. Stock owners in the affected parts are warned of the importance of early diagnosis. If blood smears are negative, and yet the first indications of Nagana are present, the tartar emetic treatment should be commenced with all expedition.

The Diseases of Stock Act.

With a view to assisting farmers in complying with the principal Acts and Regulations administered by the Department, it is proposed to publish in the *Journal* a short résumé of each, particularly in so far as they affect the farmer and the part he is called upon to carry out in their observance. The first of the series is published in this issue of the *Journal*, and deals with the Diseases of Stock Act, 1911, and its principal regulations. One of the early duties of the Union Government was to consolidate and amend the laws then in force for the prevention of disease among stock, and in view of its importance in a pastoral country, the Act now operating may well be regarded by all stock owners in the Union as their charter, to be administered by them and for them. It is trusted that all will read the résumé and become acquainted with the scope of the Act. One thing that is clearly apparent throughout is the duty of the farmer to report anything untoward in the condition of his stock. If each farmer were imbued with sufficient public spirit to regard himself as a potential administrator of the regulations, contagious diseases would soon disappear. For it is not the penalties of the law that the Government relies upon to clean the country of the pests that beset it, but the whole-hearted support and co-operation of the farming community.

The Export Trade in Oranges.

In a recent report from the Trade Commissioner mention was made of an improvement compared with the earlier shipments in the standard of oranges exported from South Africa, but the condition of some was animadverted upon. One mark of oranges that was specially examined had scarcely a fruit that was not free from external blemish. While some of these blemishes may have developed during the voyage, this cannot have been the only reason, but the result is the same—an exceedingly bad advertisement for South African fruit. This is most regrettable, particularly in view of the competition that our fruit is meeting from Australian oranges, which show a high quality, and are well graded, being uniform in size and colour. Some of the leading brokers, indeed, are already speaking of the superiority of the Australian over the South African navel. It may be pointed out that at the time the report was written a consignment of our navels that had arrived in excellent condition was fetching from 18s. to 20s. per case, while Australian navels, notwithstanding their somewhat unattractive packing, were realizing about 25s. for counts of 65 to 200. But this competition need not be feared if our exporters will ship the best fruit according to the reiterated advice of the Department.

Do not lose your copy of the *Journal*. A full index will be sent subscribers every six months. The *Journal* will prove a useful book of reference to every farmer. In time it will be a valuable compendium of advice and information on farming in South Africa.

DEPARTMENTAL ACTIVITIES.

(NOTE.—The work of the several Divisions and Schools of Agriculture covers a wide range of agricultural industry in the Union, and we give hereunder notes and observations from certain of them treating with matters of special interest coming under their purview month by month. The object of these notes, which are not concerned with general routine work, is to inform the farmer of such matters as are calculated to be of interest and helpful to him at the present time.—EDITOR.)

THE DIVISIONS.

ENTOMOLOGY.

Olive-fly Parasites.—With a view to ascertaining to what extent the larvae of these *Dacus* flies that infest the fruits of our native olives are parasitized, certain observations are being carried out by Mr. H. K. Munro, of the Division, stationed at East London. Reporting on the progress thereof, this officer states that from a parcel of infested seeds of *Olea foveolata* he has obtained six parasites, and remarks upon the habit of the maggot which lives and pupates within the seed, making an opening in the wall for its emergence when adult. The fruits of *Olea woodiana*, as found around East London, are infested with a *Dacus* different from that attacking the seeds of *O. foveolata.* These live in the pulp of the fruit and pupate in the soil. This has not yet been determined, but differs from *Dacus oleae*, Gmel.; the same species has also been reared from the fruits of *Olea laurifolia* obtained at Storms River, Knysna.

Grain Ladybird (*Epilachna similis*).—The Eastern Province Entomologist, Mr. D. Gunn, reports that during June no information showing that mischief was being done to cereal crops by this ladybird could be obtained. He adds that a number of adults captured during October, 1921, and placed in the insectary cages were still alive on the 12th June, 1922, surviving in this stage for over eight months.

Tsetse Studies in Zululand.—The following observations, briefly stated, are from a recent progress report furnished by Mr. R. H. Harris, the officer in charge of our investigation in Zululand.

Fly-belts.—The fly-belts of Zululand lie east of the Lebombo mountains and the foot-hills of the Drakensberg that extend into Zululand south of the Lebombo range. They are met with in the country that lies north of the Umhlatuzi River to the Portuguese boundary. The Enseleni and Umfolosi belts are almost exclusively inhabited by *Glossina pallidipes.* As yet no direct evidence has been found of other species, although an empty pupa case, resembling that of *G. brevipalpis* has been collected on the White Umfolosi. In the Ubombo belt, south of the Pongola River, *G. pallidipes* is the predominant species, but *G. brevipalpis* predominates in the northern or Usutu belt, a belt in which major forest exists and provides a different condition to that of the more southern belts.

Glossina pallidipes.—In order that this species may reproduce its kind successfully, it requires to have a densely shaded breeding ground and close by a regularly available food supply. In the later stages of gestation the gravid females, still requiring food, must have suitable shelter wherein to rest between meals and whereunder the soil conditions are also suited to the requirements of their offspring. It appears that the females of this species cannot exist and propagate unless these conditions occur, and the spot is visited practically every day by game. These shaded spots are relatively small and overhung by a leafy canopy, which keeps out the sun for the major part of the day. And it is on the almost procumbent branches of such haunts that the females sit and drop their larvae to the ground.

Contraction and Extension of Breeding Areas.—However suitable a spot may otherwise be, should the water supply near by dry up and the game go elsewhere, the flies disappear. Some of them must die, whilst the others migrate, chancing the finding of suitable breeding grounds. An augmentation of flies at the permanent breeding grounds has been observed. The area of infestation increases in summer and contracts in winter in accordance with the drying up of the non-permanent supplies of drinking-water for the game. The contraction is also largely influenced by a further factor. *G. pallidipes* has been found to be particularly sensitive to both extremes of heat and cold, and cannot live through the winter at many summer breeding grounds, because these become too cold. Hence it follows that its winter habitat is not co-extensive with permanent waters in the belt. The permanent breeding grounds have only been found in those places where the heat of the day is not altogether dissipated overnight, and where there is not that marked fall in the night temperature which takes place at some extension breeding grounds and many permanent waters.

Control of G. pallidipes.—It is reasoned that with the mapping out of the winter resorts of this fly, it will be found a practical matter to so deal with these places by prophylactic measures that the fly can be caused to die out and the summer radiation inhibited. In other words, by rendering these winter foci unsuitable to fly-existence, the summer expansion can be artificially controlled, and such control is only limited by the practicability of applying prophylactic measures to all winter resorts.

A Hypothesis.—That tsetse flies become eradicated over large tracts of the Union coincident with rinderpest outbreaks in the fly-belts is established, but it has long been equally obvious that the decimation of the game was not the only contributing factor. Unfortunately, one can only speculate upon what other factors may have played a part in the absence of the essential data. The problem of nagana is so intricate an association—fly trypanosome-game topography—that many of its phases seem inexplicable. Mr. Harris is led to surmise the loss of infection, however, by the majority of the wild mammalian hosts of the trypanosome. The hypothesis is presented that a loss of infection occurs when the host becomes separated from fly-contact, and the possibility is advanced that this may occur frequently with such animals as spend the winter away from the haunts of the fly; in short, that the protozoan exhausts

itself in the blood of the wild host within a certain time if not rejuvenated by passing through the insect host.

If this were not so, practically all the wild hosts of the trypanosome would show constant infection; this, available evidence goes to indicate, is not the case. Moreover, the removal of such animals from fly-belts to all parts of the world to be enclosed in zoological gardens, in close contact with susceptible animals, might well have led to a multitude of sporadic outbreaks of nagana. Everywhere it must be admitted there are biting flies capable of transmitting infection mechanically, just as they do in the areas where the disease is epizootic in Zululand to-day. At least sixteen zebras have been sent oversea from the Umfolosi fly-belt in recent times, and animals are obtained indiscriminately, irrespective of fly-belts, for zoological gardens.

Only experiment can demonstrate whether or not the trypanosome exhausts itself relatively quickly in its wild mammalian host in the absence of tsetse. And, should this prove to be the case, it may have a most important bearing on the practical control of nagana, which would then resolve itself into a limited destruction of the wild mammalian reservoirs that frequent the contracted winter breeding grounds of the fly.

Wintering of G. pallidipes.—It has recently been possible to demonstrate that this species continues to propagate throughout the winter, and that it does not hibernate. The period of gestation and the pupal period are, however, lengthened out to as much as twice the lengths of the summer periods.

Fly Hosts.—As regards the favoured hosts of *G. pallidipes*, it may be said that much seems to depend upon bulk, gregariousness, complacency, and hairiness. It has been observed that the larger the animal the greater the number of flies attracted to it, and that a troop is more attractive than a single animal. Further, slow-moving and browsing animals seem to collect more flies than fast-moving ones. Complacency under attack seems to go with the thicker hide and the accompanying paucity of hair.

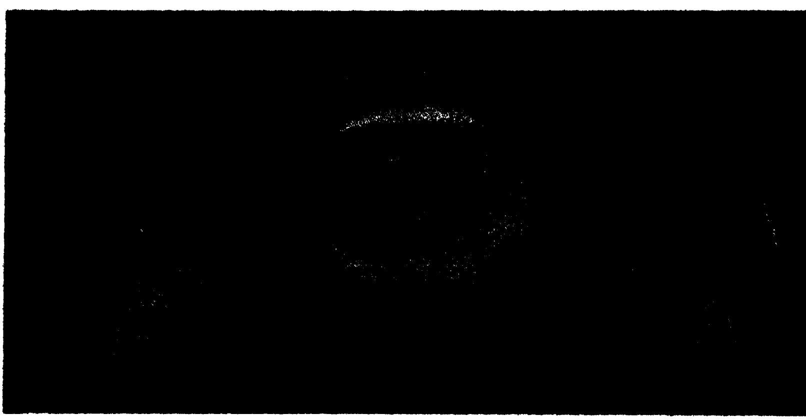
BOTANY.

The Spanish Reed (*Arundo donax*) is a tall reed grass, with stout stems from ½ to over 1 inch in diameter, massive creeping root stock, and heads of feathery flowers. There has recently been a demand from overseas for these reeds for use in the manufacture of musical instruments and of fishing rods. Samples sent to the Imperial Institute were submitted to firms of manufactures, and were reported on favourably, and a small trial consignment has been sent to England.

It is now a question of transport charges, etc., as to whether the export of these reeds will be a paying proposition. They grow freely enough in the warm moister parts of the Union, and there is little labour attached to the harvesting of them; careful selection, cutting at the right time, and baling them in bundles of about 200 lb. each, is about all that is required. Of course, the market is not a very extensive one, the quantity of these reeds used in the trade being comparatively small.

Citrus Export.—A serious defect has been observed in citrus fruit within the last few years, and was particularly severe this season. From time to time the Government Fruit Inspector has submitted specimens to the mycologist at Capetown, and the defect had been ascribed by him to cold injury. Mr. Turner, the Citrus Adviser to the Rhodesian Government, has recently called our attention to the same thing, and he states that in the district where it was most prevalent they had exceedingly hot weather followed by a very cold spell. The trouble is not due to any parasitic organism, and is probably to be attributed to unfavourable climatic conditions.

In Rhodesia the chief injury is noticed in the Mediterranean sweet and the Joppa varieties, heavy losses being reported this season in the former. The fruit is puffy in appearance, and has a number of sunken grooves, many of them in the longitudinal direction. This grooving is due to the collapse of the oil glands in the affected area,



[*Photo by V. A. Putterill.*

Grooving and Splitting of Citrus Fruit.

which is softened, but not otherwise unhealthy in appearance. Later splits occur along these grooves and decay naturally sets in (see figure). Such fruit is quite unfit for export.

The Mycologist at Capetown also reports that many types of unsuitable fruit still come forward for export. One finds long stalked fruit, malformed navels, bad grading, injury in packing, various blemishes, thick-skinned grape fruit, and abnormal oranges.

Diseases in Sudan Grass.—Of the diseases which have been most in evidence this last season, and which are likely to prove injurious to Sudan grass in this country, that caused by the fungus *Helminthosporium turcinum* and an unidentified bacterial disease are the most important, and of these two the latter is apparently the more serious.

As is the case with any injury to this crop—whether caused mechanically or of disease origin—the symptoms of both these diseases are characterized by a reddish brown spotting and streaking

of the leaves, and it is almost impossible for the layman to distinguish between them. However, *Helminthosporium turcinum* may be recognized by the presence of fungus threads in the tissues and typical 5-8 septate, olive-coloured spores on the surface of the grass, and the bacterial disease by the presence of bacteria in the veins of the leaves.

The injury caused by the bacterial disease is usually of a serious nature, but that caused by *H. turcinum* varies with the prevailing climatic conditions. Under conditions such as prevail in parts of Natal, where there are heavy mists, etc., the disease may destroy the entire crop, as in the case of the bacterial disease, but under drier conditions the loss may be negligible.

No remedy is known for these diseases. Spraying might be effective in the case of the fungus trouble, but it is not practicable. Control measures in both cases will probably consist in crop rotation, selection, and breeding of immune varieties.

The Mexican Poppy (*Argemone mexicana*).—Some interesting work has been done recently with the seeds of this plant, and its properties as a possible drug-plant and oil-producer have been investigated. Full details of the results of these tests will be published in a later number of the *Journal*.

SHEEP.

Preparation of the Dip.—Farmers should note that where an inspector has to prepare the dip from lime and sulphur supplied by the owner, the following utensils must be supplied: One 25-gallon pot for boiling lime and sulphur, receptacle for mixing ingredients, a fine sieve, 2 buckets or paraffin tins, 2 dipping forks, scale for weighing and a bag for straining of dip.

An authorized dip is lime and sulphur, which should be prepared as follows: Put 20 lb. of slaked lime or 15 lb. of unslaked lime in a bath and mix thoroughly with 25 lb. finely ground sulphur. Add enough water to make a thick paste. Throw the mixture into a pot containing 10-25 gallons of boiling water, and let this boil for about 40 minutes until a deep orange or dark purple colour is obtained. If the correct colour is not obtained, the lime is of an inferior quality and more lime should be added and the boiling continued until the requisite colour is obtained. If more than 30 lb. of unslaked lime or 40 lb. of slaked lime is required to make a dip of full strength, the dip must be discarded and other lime procured. When the dip has been thoroughly boiled and the correct colour obtained, the liquid should be strained through a bag. To every 10 or 25 gallons of dip prepared in the above manner 90 or 75 gallons of clear water should be added to bring the mixture up to 100 gallons for every 25 lb. of sulphur used. By Government Notice No. 1034 of 1921 there was added to the definition of "authorized dip" any manufactured lime and sulphur dip, provided it is guaranteed as non-injurious to sheep and wool and is sold under such guarantee of composition that when diluted ready for use the tank fluid shall contain not less than 1.5 per cent. of polysulphide sulphur. The following proprietary dips comply with the above regulation:—Capex, Champion, and McDougall's lime and sulphur dip.

Vigilance Committees.—That the Department, in its efforts to eradicate scab, is largely dependent on the assistance of the farming community is being more and more realized, and from many sides offers of assistance are being received. At the Congress of the Cape Province Agricultural Union held last year at Kimberley, the manner in which practical co-operation could be effected was fully discussed, one of the resultant decisions being to found vigilance committees from among the members of local Farmers' Associations. The main object of these committees is to assist the Department in cleaning the district. Although the members of such a committee have no special powers, they can, on account of their local knowledge, assist in many ways, for instance, by bringing to the notice of the local inspector any outbreak of scab which has not been reported and any illegal movements which may come to their knowledge. If their district is not already protected, they could encourage the farmers whose flocks are infected to make a special effort to cleanse and keep them clean so that, in course of time, the district could also apply for protection and the consequent advantages.

Vigilance committees have accordingly been formed in several districts and have proved a great success. It is trusted that this movement will spread over the whole Union and lead to ultimate success in stamping out the disease

CHEMISTRY.

Alleged Toxic Effect of Chemical Fertilizers upon Stock.—Dr. Juritz, Chief, Division of Chemistry, writes: In my note on basic slag in the July issue of the Journal, reference was made to a paper on "Basic Slag and Rock Phosphate" by the New Zealand Agricultural Chemist, Mr. B. C. Aston, F.I.C., which appeared in the *New Zealand Journal of Agriculture* of 21st November, 1921, in the course of which he makes the following remark in connection with the use of slag as a top-dressing:—

> "With regard to the poisonous nature of basic slag, the necessity of allowing ample time for the rain to wash the slag off the herbage before depasturing stock on it is one which in most cases can be avoided; the fact that such poisonings may occur is evidently not universally known, and therefore must be pointed out."

As far as I am aware, cases of poisoning by basic slag are unknown in South Africa; in fact, where it has been spread on pasture-land, although the operation has generally been carried on during a fall of rain, or with rain impending, it has never been the practice to take precautions to keep sheep or cattle from the land during operations.

Under the circumstances I wrote to Mr. Aston for information as to any local experience he might have in this connection, but he could recall only one such occurrence in New Zealand, namely, in the arid district of Central Otago, where mortality amongst stock was suspected of having been caused by slag.

The toxic qualities attributed to chemical fertilizers are by no means certain, and the little information available on the subject is

rather contradictory. It will therefore be useful to record here the results of some experiments on sheep by G. Güntyer and O. von Czadek carried out some three years ago at the Veterinary College and Agricultural-chemical Experiment Station, Vienna.*

Poisoning had occurred in Carinthia amongst a flock of sheep grazing on a meadow which had shortly before been manured with basic slag, kainit, and nitrate of soda, and it was in consequence of this that the experiments were undertaken. Each sheep was given 100 grammes ($3\frac{1}{2}$ oz.) of a certain fertilizer in its rations daily with the following results:—

In the case of basic slag, two experiments out of three resulted fatally. When superphosphate was given, death occurred in one experiment after eight, and in another after eleven, days. It was concluded, therefore, that precautions should be taken in regard to land manured with superphosphate, and that basic slag cannot be considered harmless, although in practice it may be found less poisonous than the experiment showed, as it is not spread thickly enough to enable animals to take up such a large amount as was fed to them.

Kainit was found poisonous if fed in the proportion of 3 to 4 grammes per 1000 grammes of live weight. It caused intestinal inflammation and diarrhœa, a relatively small amount sometimes producing fatal results, while a much larger quantity failed to bring about serious disturbances, being evacuated before absorption can take place. Sulphate of ammonia caused death in a few hours if taken in the proportion of about 4 grammes per 1000 of live weight, and in several days when taken in smaller proportion. Sodium nitrate was followed by fatal results when given in the ratio of 1 to 2 grammes per 1000 grammes of live weight, subject to the conditions mentioned in connection with kainit. Potassium nitrate was even more poisonous, causing death when taken by a sheep in the proportion of from $\frac{3}{4}$ gramme to $1\frac{1}{2}$ gramme per 1000 grammes of live weight, and in nearly every case brought about death within twenty-four hours.

THE SCHOOLS OF AGRICULTURE AND EXPERIMENT STATIONS.

GROOTFONTEIN, MIDDELBURG (CAPE).

Irrigation Experiments.—The construction and laying out of the block of 260 plots to be used for irrigation experiments was completed towards the end of May. These are the only plots of their kind in the country, and it is felt that the money expended will be more than justified by the results to be obtained.

A main furrow (Plate I) supplies thirteen laterals (Plate II), each of the latter in turn irrigating a series of twenty beds, with a 7-foot space between the series. A 4-inch pipe through the wall of the lateral is the means by which water is led on to each bed (Plate III). The plots have each an area of 1-80th acre, their dimensions being 33 ft. × $16\frac{1}{2}$ ft.

* Communicated by them to the *Zeitschrift für das Landwirtschaftliche Versuchswesen in Deutschösterreich* (Vol. 22, pts. 3 and 4, pp. 69–82), abstracted in the *Monthly Bulletin of Agriculture Intelligence and Plant Diseases* (December, 1919, p. 1167).

At the end of May a uniform wetting of 4 inches was given to all the plots, the water being measured by a right-angled V-notch in the main furrow. Four beds were watered at a time—two on each side of a lateral, the time taken to apply 4 inches of water varying with the height of water over the notch, about 11 to 12 minutes being required with an 8-inch flow over the notch. After irrigation the beds were loosened by means of garden forks and seeded to "bird-proof" wheat at the rate of 35 lb. per acre.

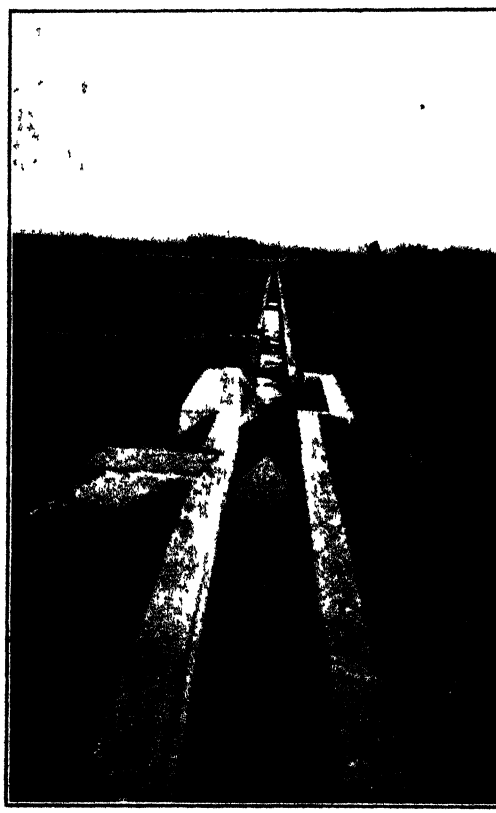


PLATE I.—Main Furrow, looking South, and showing V-notch in Centre.

The reason for treating all the beds alike is to determine the variability in natural productivity of the soil (other conditions being the same), for it is obviously impossible to carry on experiments in connection with the effect of different quantities of water on a crop if the variability of the soil is an unknown quantity. This error can be overcome to some extent by having a large number of replications. It is better, however, to conduct uniformity tests first, and then by plotting frequency curves to determine how reliable will be the results of experiments on the particular plot of ground.

PLATE II —Lateral Canals Looking East

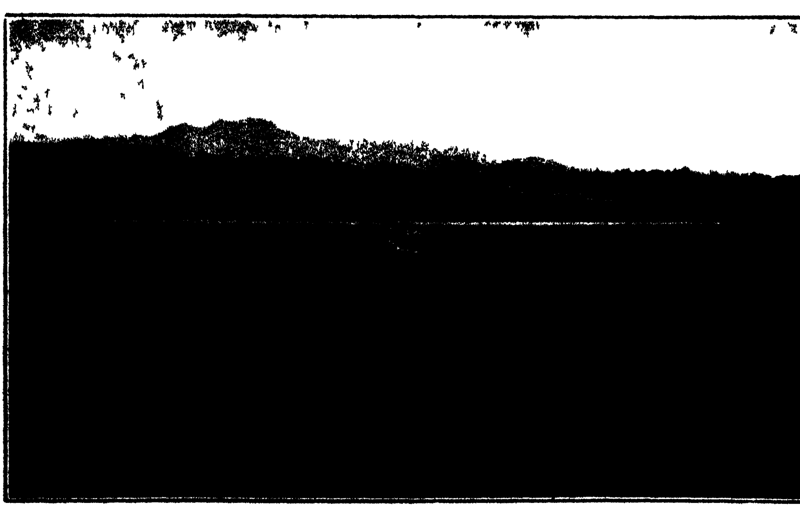


PLATE III —4 in Pipe leading into Bed from a Lateral Furrow.

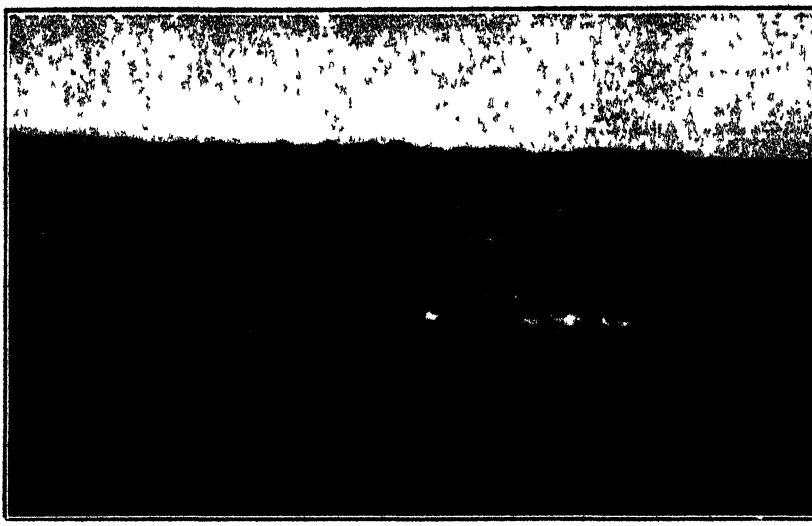


PLATE IV.—Bird's-eye View of Irrigation Plots and their Surroundings

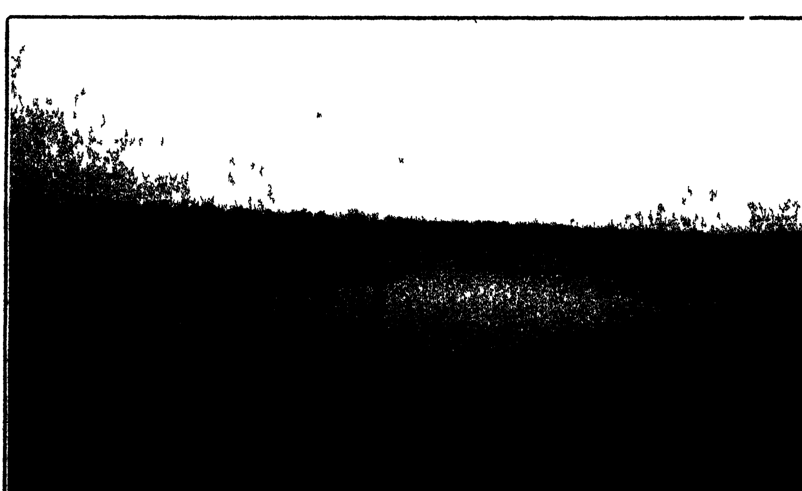


PLATE V.—Storage Dam

It is anticipated that these preliminary experiments will cover a period of a couple of seasons. Subsequently, the object will be to determine the following: (*a*) The quantity and distribution of water that will give maximum yields per acre with the chief forage crops of this area, namely, lucerne, maize (for silage), Sudan grass, mangels, and possibly cowpeas or some other summer annual legume; (*b*) the quantity and distribution of water to give the maximum yield per inch of water used; (*c*) the effect of (1) giving uniform applications of water at fixed intervals of time, (2) watering at different stages in the growth of crops, (3) gradually increasing the quantity of water from early growth until flowering and then gradually decreasing the amount until maturity; (*d*) the quantity of water required to injure crop growth; (*e*) other observations will also be made, such as (1) variations in the composition of crops resulting from the use of different irrigations, (2) the effect of large and small quantities of water on the soil composition and on the development of "brak."

These give some idea of the work to be done, but do not by any means cover all the problems to be investigated.

A bird's-eye view of the plots and their surroundings can be obtained from a study of Plate IV, while Plate V shows the storage dam of some 750,000 gallons capacity, which supplies the plots and which, in turn, receives water from an ever-flowing spring. The composition of the water will be determined from time to time.

Other plots, similar to those already described, are to be brought under canals. They are to be utilized for manurial and rotation, plant pathological and varietal investigations.

The total area under plots will be, roughly, about 10 acres, made up of some 570 odd 1-80th acre plots, all having the dimensions 33 ft. × 16½ ft.

These plots should prove of considerable interest to the public, and Grootfontein visitors should avail themselves of the opportunity of inspecting the work so far as it has gone.

Stone-lined Reservoirs.—A reservoir was built at Grootfontein a few years ago, the walls being constructed just of earth, 5 feet high, about three feet wide at the top, and about 14 feet wide at the base. The inside of the walls was cobbled with round cobbles, well rammed into the earth, and these were grouted out with cement-mortar to make the wall absolutely water-tight. Later on the height of the walls was increased by 2 feet, and the extra addition of wall also lined with cobbles as before, and water-proofed with cement-mortar. As the reservoir was required very soon after the completion of this addition in height, there was no time to allow the top portion of the wall to settle down properly. Experience now shows that in places where the new earth was not thoroughly rammed, a small crack is formed at the line of junction between the top of the original stone lining and the base of the new lining owing to the settling down of the earth in the new portion of the wall. This should be pointed out as a guide to farmers who may wish to increase the height of an existing dam wall which is lined with stone, the additional height of which is also to be lined. The extent to which earthwork will settle depends on many factors, and greatly on the degree to which the earth has been rammed after depositing, but it is certain that earthwork settles, although sometimes opinions are expressed to the contrary.

Citrus Manurial Experiments.—Important experiments have just been laid down in co-operation with farmers in the Kat River Valley with a view to demonstrating the effect of fertilizers supplying nitrogen, potash, and phosphate singly and in combination with each other. The effect on the trees of growing a green leguminous-manure crop, with a dressing supplying potash and phosphorus, will also be studied in comparison with the condition of trees receiving a complete fertilizer, and also untreated trees. The orchard selected for this experiment is laid out on a deep, fine sandy silt soil on the banks of the Kat River. The soil is well drained, and there is no danger of "brak." A further experiment will be carried out in another orchard, the major portion of which has received kraal manure applied in pits between the trees, but a portion not so treated has been reserved for the purposes of experiment, and it will be possible to compare trees which have received no fertilizer or manure for years with others receiving complete artificial fertilizer, kraal manure alone, and kraal manure plus a dressing of superphosphate and sulphate of potash. The full results of this experment will be available only after the second season or even longer, but they should produce valuable information for citrus growers in the Eastern Province in regard to manurial requirements.

Veld Grazing.—It is proposed, with the co-operation of various farmers in the Karroo area, to study the effect of grazing on vegetation by carefully recording the extent to which grazing has been carried out, the season of the year during which certain areas have been grazed off, and investigating the extent to which these two factors affect the flora.

Poultry.—The comparison which has now extended over a period of eleven months between dry mash and wet mash for feeding has indicated that birds fed on dry mash are again in full lay after completing the moult, and the birds on this feed have laid 22 dozen more eggs than those fed on wet mash, while the eggs produced are of a larger size. Incubation results at the School have been eminently satisfactory; fertility has been better than in previous years, and results have shown hatchings of 95 per cent.

The Kingwilliamstown Poultry Show was held on the 4th and 5th July, at which the entries showed a marked improvement on the previous year. The progress made in the Utility White Leghorn classes is particularly noteworthy, and is a general feature throughout the Eastern Province.

POTCHEFSTROOM, TRANSVAAL.

Sudan Grass.—Sudan grass, if sown in October, with the first spring rains, will germinate well and easily yield two heavy crops of forage during the season. If intended for hay production, it is best sown broadcast at the rate of 15 to 20 lb. per acre. The crop requires to be sown thickly, otherwise the straw will be too coarse, and not so suitable for feeding as that from crops sown at a heavier rate. It is a fairly drought-resistant plant and deserves to be grown more extensively in the drier areas of the Union.

Lucerne.—During the latter part of August or early in September, just before active growth starts, the lucerne crop should receive a thorough cultivation. This is best done after the first irrigation. Heavy cultivators, such as the Martin and Roberts' Lucerne King Cultivator, could be profitably employed without any danger of injuring the plants. The first cultivation is of great importance and should be done thoroughly, otherwise weeds, the chief enemy of the crop, are sure to crowd and smother it. Where the above implements are not available, an ordinary heavy, spike-tooth harrow or preferably a disc-harrow with the discs set straight, could be used to advantage. Lucerne is a deep-rooted plant, and there is no danger that any of the plants, if well established, could be uprooted with the cultivations. Immediately after the first irrigation and just before the first cultivation is given, a top-dressing of superphosphate at the rate of 400 lb. could be given. This will stimulate growth throughout the growing period and increase the yield. Lucerne, in comparison with other crops, requires a large amount of water to produce one ton of dry matter, and the crop should therefore not be stinted. Over-irrigation, however, which might easily occur if the sub-soil is of a clayey character, should be avoided at all costs. Watch the crop; if it requires water, let it have sufficient, but no more.

Horticulture.—Recently planted trees will need one or two good waterings during the month if early rains are not experienced. Where severe wind storms occur with any degree of regularity, or where hares are troublesome, the trees may be protected by tying grass or paper round the stems until growth commences. Where there is a danger of young trees suffering from sunscald, the stems should be given a coating of white wash to protect them until sufficient shade has developed. All apples and pears should have been sprayed with one or other of the commercial preparations to control insect pests and fungoid diseases. Where trees are to be grafted over to more satisfactory varieties, the work should be completed as early as possible. Gather up all prunings and have them burnt so as to facilitate cultural operations when rain occurs. Supplies of arsenate of lead should be obtained to combat codling-moth. The purchasing of box material is another item for immediate attention on the part of the growers. Keep a sharp look-out for peach aphis, and control it before the crop suffers to any extent.

GLEN, ORANGE FREE STATE.

Foaling Season.—One of the most common causes of loss during the foaling season is joint-ill of foals. And foals of the heavy draft breeds seem more susceptible to this disease than foals of other breeds. The disease has been successfully combated by the use of a vaccine. But whether or not this is used, it does not obviate the necessity of having the mare foal in clean quarters. The foaling box should be thoroughly cleaned and disinfected beforehand. It is also advisable to disinfect the external genitals of the mare after foaling. Paint the foal's navel cord daily with tincture of iodine, until it is dried up. It is a good policy to follow the application of iodine with a drying powder, and for this purpose equal parts of boric acid, tannic acid, and alum make a good mixture.

Maize, Sunflower, Sorghum, and Sudan Grass for Fodder.—An experiment was laid down in the past season to ascertain the comparative value of these crops in this semi-arid area for fodder purposes. Owing to the deficiency of the rainfall, none of the four reached proper maturity, and most of them had to be cut before properly mature, in order to prevent them dying from drought. The sunflowers made good early growth, and looked well in January, but they suffered much more from the lack of water than the other three. The Sudan grass plots, though interspersed with the others, were eaten off down to the ground by locusts, while the maize, sunflowers, and sorghums were practically untouched. Consequently, as far as the Sudan grass is concerned, no fair comparison can be made. Taking the yield of maize as 100 per cent., the yield of sorghum was 83 per cent. and of the sunflowers 66 per cent. This experiment needs to be repeated for confirmation or otherwise of these results.

Maize Varieties for Fodder Purposes.—The order of merit for fodder purposes of the three varieties tried was as follows: (1) Yellow Cango, (2) Natal Eight-row, and (3) Chester County. Early in the season the Chester County looked the best, but it suffered much more from drought than the other two, and ended up by being last.

Lice on Pigs.—Pigs are often troubled with a species of louse commonly known as the pig-louse (*Haematopinus suis*). This species is an active blood-sucker, and is among the largest of lice, measuring one-fifth inch in length. It is a flat, oval insect, with a long narrow head, and its legs end in long claws, which enable it to move rapidly among the bristles of the pig. The pig-louse spends its entire life on the body of the host, and attaches its eggs or "nits" to the bristles. While it may occur on all parts of the body, the favourite spots are within the ears, behind and in front of the ears, on the breast, and in the armpits.

For the destruction of these parasites, dipping, spraying, or hand-dressing may be resorted to. Dipping is usually more convenient in the case of young pigs, and spraying for adult ones. Various substances may be used as dips or sprays. Smythe recommends Jeyes' fluid, diluted 1:60 with water. Other substances are creolin (5 per cent. solution), and nicotine extracts, diluted according to the directions of the manufacturers. Treatment should be repeated after about a week, in order to destroy lice that may hatch out from remaining eggs. The sleeping quarters of pigs should be thoroughly cleaned and disinfected at the same time as dipping or spraying takes place. For hand-dressing, the parts infected with nits and lice may be rubbed with a cloth soaked in paraffin or a mixture of paraffin and linseed oil (1:1). An ointment prepared by thoroughly mixing equal quantities of paraffin, sulphur, and lard is also effective.

If the pigs are running in enclosed camps a little crude oil, sufficient to form a thin layer on top of the water, may be poured into the wallow about every ten days. American pig farmers find this a useful method of checking lice on pigs. Another method is to tie a sack or other coarse cloth around a post at a proper height, so that the pigs may rub against it; the sack is periodically saturated with crude oil.

Depth of Ploughing.—The result of an experiment at this institution last season showed that land ploughed ten inches after the rains in early summer gave a 20 per cent. better yield than land ploughed four inches deep at the same time, and 7 per cent. better than land ploughed seven inches deep. The experiment was carried out on a sandy loam, and owing to the deficient rainfall the crops did not set grain properly, and had to be harvested before properly mature, the percentages above representing total weights of grain and semi-dried stalk and leaf. Owing to these circumstances the individual results varied considerably, but the general result reflected by crops of sunflower, maize, and sorghum is as shown above, and since each percentage represents an average of eighteen results, the figures may be accepted with a fair degree of certainty for the conditions of the experiment.

ELSENBURG, MULDERS VLEI.

Suffolk Down Rams for Sale.—Ten pure-bred Suffolk Down ram lambs will be offered at our annual sale on 11th October. At present they are just under a year old. The best will tip the scale at 150 lb., which indicates they are very early maturing, well grown, and very compact, combining excellent depth and width of body. They will carry about 11 months' fleece at the time of the sale. The dams of these yearling rams are typical specimens of the Suffolk Down breed, being of good size, constitution, and development of mutton qualities. It is regretted that so few Suffolk Down rams are available for disposal, as the demand during the past few years has always been in excess of our supply. Last year 22 guineas were paid for a yearling Suffolk Down ram, the average price obtained being 16 guineas. It is hoped that within the next few years from 20 to 30 rams at least will be available for disposal at our annual sales.

In the production of cross-bred lambs for the early market, the Suffolk has in recent years frequently won the highest honours at the Smithfield Show, England. Elsenburg has won first prize with Suffolk Merino cross-breds in both the lamb and wether classes at the Rosebank Show.

Experience shows that the practice of crossing the pure-bred Suffolk (ram) on the ordinary Merino (ewe) is profitable. The lambs are very early maturing, and are ready for disposal to the butcher before grazing becomes scarce towards the end of the summer.

Trees on Earthen Dam Walls.

Trees are sometimes planted on earthen dam walls with the idea that the roots of the trees will bind the soil together, and so prevent the bank from wearing off too rapidly. Willow trees are often put in, but this is a mistake, as the roots in growing into the bank make miniature tunnels through the soil, and if these roots come to die and decay, the channels are left, and the water has a better chance than ever to get through the wall. Vegetation should certainly be encouraged on dam walls, but only small stuff, the roots of which do not go deeply into the soil. Small bush and grass is better than large trees.

LOCUSTS: SEASON 1921-22.

Report by R. H. WILLIAMS, Officer-in-Charge, Locust Administration.

THE locust season under review has been the worst that South Africa has experienced for over twenty years. A heavy infestation was anticipated, but not nearly of such intensity and so widespread as was the case.

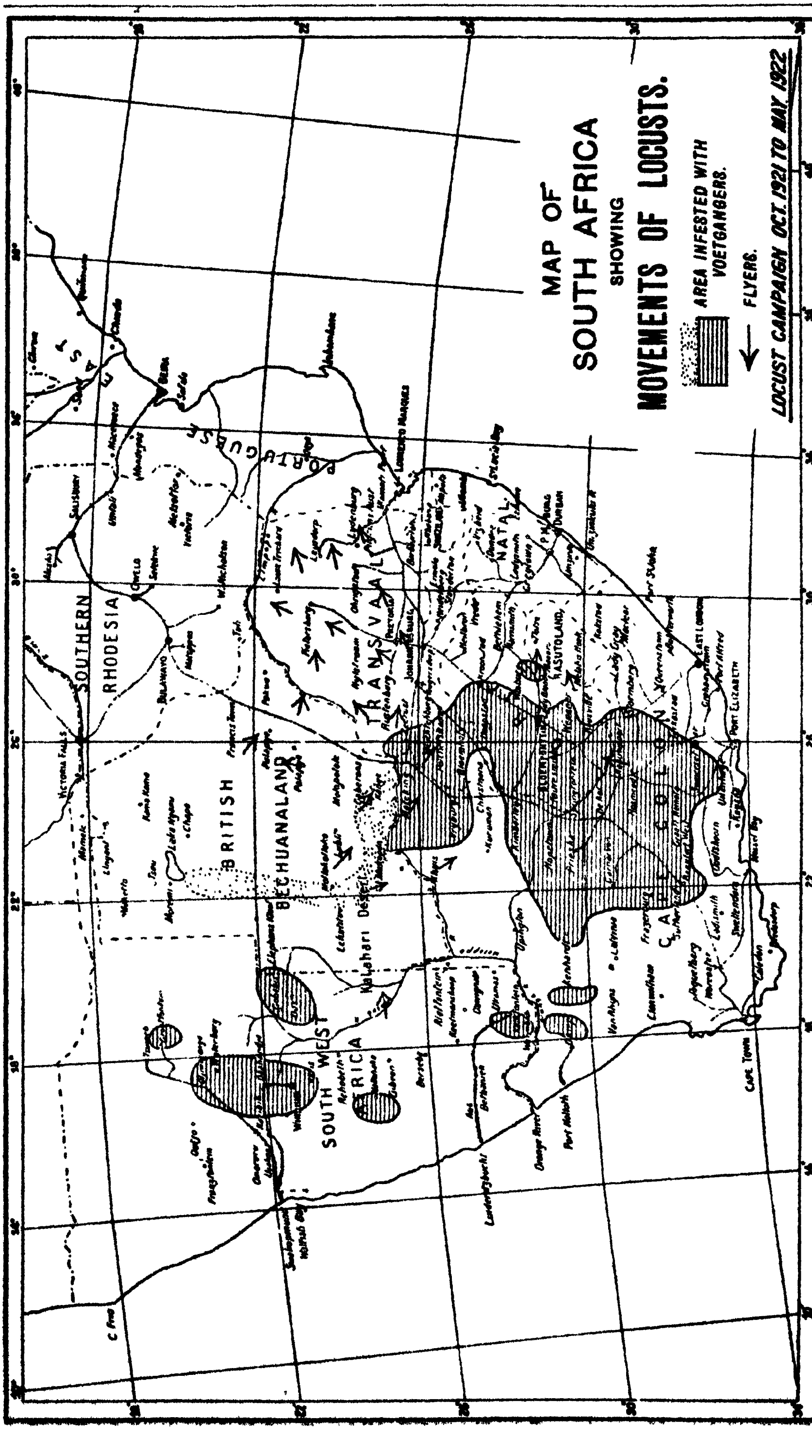
Reference to the accompanying map will show that the whole of the Karroo, Bushmanland, the north-western districts of the Cape Province, the western half of the Orange Free State, and the western districts of the Transvaal were infested with voetgangers. The campaign commenced during the last week of September, 1921, and ended in the middle of May, 1922. The first voetgangers were hatched out in Prince Albert District, and the last in Mafeking and Vryburg Districts. During the season 58 magisterial districts were infested with voetgangers; 118,662 swarms were destroyed under supervision, and 92,675 gallons of concentrated, that is, approximately 5,000.000 gallons of diluted, poison were issued.

Owing to the fact that in a large number of the infested districts only intermittent light showers fell, the campaign was extended over a longer period than it would have been had good heavy rains fallen and all the eggs hatched out at one time.

Having two campaigns naturally increased the expenditure and rendered the work of the locust officers far more difficult, in that it required constant pressure on their part to keep the farmers enthusiastic over the destruction of the locusts. Had heavy rains fallen the voetgangers would have all hatched out at one time, the campaign would have been over much sooner, and even better work than has been done would have been accomplished. A peculiarity that occurred in one or two districts was that the bottom layer of eggs hatched out before any rain fell. This is accounted for by the fact that the eggs were laid in damp ground. The bottom layers hatched out as soon as the weather became warm, but the top layer only hatched out when the rain fell and they received the necessary moisture.

EXPLANATION OF REAPPEARANCE OF LOCUSTS IN SUCH VAST NUMBERS.

The theory that outbreaks of locusts follow a severe drought has been amply proved this season, for the districts in which the infestation was most intense were those that suffered severely from the drought of 1919. When this drought broke, breeding up commenced, but, as locusts had not been prevalent for some time, the farmers had become lulled into a sense of security and did not take notice of the stray and scattered locusts that appeared in 1919-20. So greatly and quickly, however, do the locusts multiply, if unmolested (experiments have proved that one female can lay between 300 and 400 eggs in her brief lifetime), that in 1920-21 the scattered locusts formed into swarms, and as many as 27,000 swarms were destroyed. The reason for the abnormal outbreak during the past season is difficult


MAP OF
SOUTH AFRICA
SHOWING
MOVEMENTS OF LOCUSTS.
AREA INFESTED WITH VOETGANGERS.
FLYERS.
LOCUST CAMPAIGN OCT. 1921 TO MAY 1922
SOUTHERN RHODESIA
BRITISH BECHUANALAND
TRANSVAAL
NATAL
BASUTOLAND
SOUTH WEST AFRICA
PORTUGUESE
Kalahari Desert

to explain, but is probably due to the fact that, owing to favourable climatic conditions, in addition to the hatching of the eggs that were laid by the swarms that escaped destruction in 1920-21, the eggs that were deposited the previous season and did not get sufficient rain to hatch them out during last season, also hatched out during the present season.

SHORTAGE OF POISON.

The temporary shortage of poison which occurred in the latter part of November was most regrettable, the more so as it unfortunately occurred at a most critical time. The blame for this shortage, however, cannot be laid entirely at the door of this Department, as, according to the information in its possession in regard to egg

Voetgangers at Strydenburg.

deposits, the Department was justified in estimating that with the poison left over from the previous campaign in the various depots in the districts, and the stock in the main depot at Bloemfontein, it was fully prepared for a campaign of a size proportionate to the egg-laying that has been reported to have taken place.

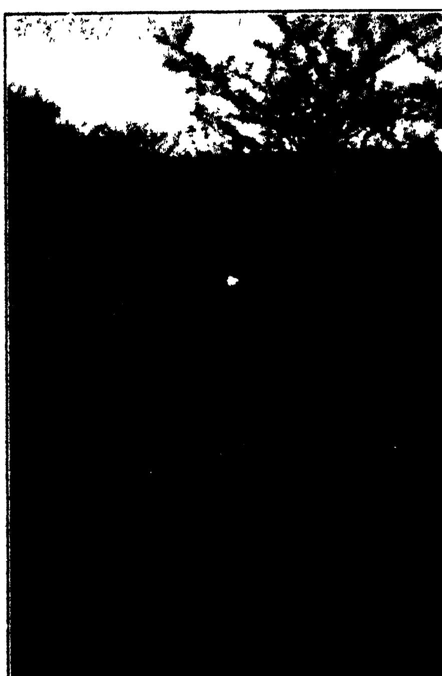
The information in its possession in regard to egg-deposits, which, had it not been for the locust officers, would have been even less than it was, did not, however, nearly reflect the true position. Voetgangers were hatched out in myriads in one district after another from which no reports regarding egg-deposits had been received. The farmers themselves must, therefore, accept a large proportion of the blame for the temporary shortage of poison in that they neglected to report the egg-laying that had taken place on their farms and so enable the

Department to better gauge the probable extent of the next season's outbreak. When the demand for supplies of poison became so heavy and urgent, its manufacture was continued night and day, and no stone was left unturned to endeavour to meet the demand, but it was utterly impossible to avoid a temporary shortage.

An additional explanation of the shortage was the wilful waste that occurred in some of the districts. Had owners adhered to the instructions regarding the mixing of the poison and not mixed it unnecessarily strong, the supply would have gone much further.

CO-OPERATION OF THE FARMERS.

In no previous campaign have the farmers co-operated so well with one another and with the officers of the Department. Taken as



Masses of Voetgangers.

a whole, they did excellent work, and only in a few isolated instances was it necessary to institute legal proceedings.

It would not be out of place here to insert a word of appreciation of the manner in which the large stock-owners in the Karroo, who have very little to fear from the locusts, combined and destroyed the voetgangers. There is certainly some excuse for the stock-farmer not being quite so enthusiastic over the destruction of the locusts as the agricultural farmer, but the former complied with the spirit as well as the letter of the law. There is no doubt that the agricultural farmers in the other parts of the Union are inclined to blame the stock-farmers in the Karroo for the visitation of the locusts to their parts. Reference, however, to the statement appended to this report,

showing the number of swarms killed in the various districts of the Karroo, will dispel the idea that the campaign in this part of the Union was carried on indifferently. Had the swarms that were destroyed in the Cape and also the Orange Free State been allowed to reach the winged stage, very few crops in the Union would have escaped devastation.

METHOD OF DESTRUCTION OF VOETGANGERS.

Of the two methods of destruction, viz., spraying and baiting, the latter is rapidly becoming the more popular of the two. In some districts—notably Beaufort West—after the District Locust Officer

Preparing Poisoned Bait on the border of the Kalahari.

had demonstrated how the bait should be prepared and laid, the baiting process was adopted practically throughout the whole district. The chief advantage the baiting process has over the spraying is that it obviates the necessity for transporting water over long distances.

The material (dried manure, donkey for preference) for making poison bait is, however, not always easily procurable, and in some districts, willy nilly, the spraying process had to be adopted and water carted long distances. To assist farmers with the transport of water an arrangement was made with the Railway Administration for the sale to farmers of 40-gallon oil-barrels at 3s. 6d. each with one head and 5s. with two heads. It is understood that quite a number of these barrels were purchased by the farmers.

DESTRUCTION OF FLYING SWARMS.

Every encouragement has been given and every effort made to get the farmers to destroy as many as possible of the flying locusts, and quite a large amount of destruction has been effected. The natives are known to have collected thousands of sacks of flying locusts, chiefly in the Mafeking, Vryburg, and northern Transvaal districts. Several suggestions have been put forward for destroying the flyers, the most popular of which is the use of aeroplanes. Inquiries made at the Defence Force Headquarters, however, elicited the fact that, though aeroplanes might be used to advantage from a scientific point of view, i.e. for the purpose of following up the swarms, from a destructive point of view their use was impracticable for the following reasons: (*a*) An aeroplane can remain in the air continuously for 4½ hours only; (*b*) an aeroplane can only land on prepared ground; landing grounds would, therefore, have to be surveyed and constructed at various centres, and then the locusts would not always oblige by flying

Loading Poisoned Bait in the Midlands, C.P.

in the direction of the landing places; (*c*) no effective weapon for fighting the locust from an aeroplane is available; gas bombs and liquid fire would be equally useless and purely local in effect; (*d*) aeroplanes could not fly through locusts: the propeller would be promptly damaged and the machine put out of action; (*e*) the expenditure involved in connection with the running expenses (£4 per hour), construction of landing places, erection of petrol and oil depots, equipment, etc., and the very small amount of damage that can be caused to a swarm of locusts from an aeroplane, do not justify its use for the purpose of destroying locusts.

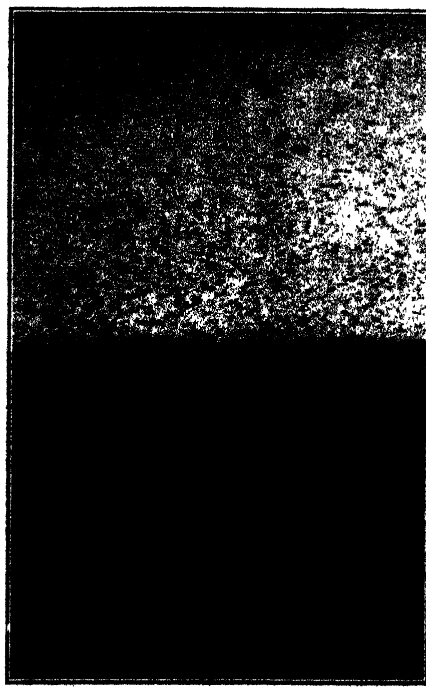
Experience has proved, however, that the most effective method of destroying flying swarms of locusts is by spraying them with poison while they are resting at night or in the early morning. A large amount of damage to flying locusts has been carried out in this manner during the past season.

NATURAL ENEMIES TO LOCUSTS.

The flies and birds caused a considerable amount of damage amongst the locusts; the latter, however, would have rendered far

more assistance if the rains had come earlier. In some districts, by the time good rains fell and the voetgangers had hatched out the birds had gone north again.

Flies.—The large grey fly (*Wohlfahrtia brunispalpis*), which deposits its maggot on the back of the locust, was prevalent during last season amongst the locusts, especially in the western Karroo, Bushmanland, Kenhardt, Prieska, Calvinia, Carnarvon, and Fraserburg Districts, where it attacked and destroyed large swarms of flying locusts, also voetgangers in the last stage. In Bushmanland, on the border of Kenhardt-Calvinia and Namaqualand, this fly was in such numbers that it became a nuisance to the population. In Bechuanaland single specimens were noticed in April, and it is hoped that



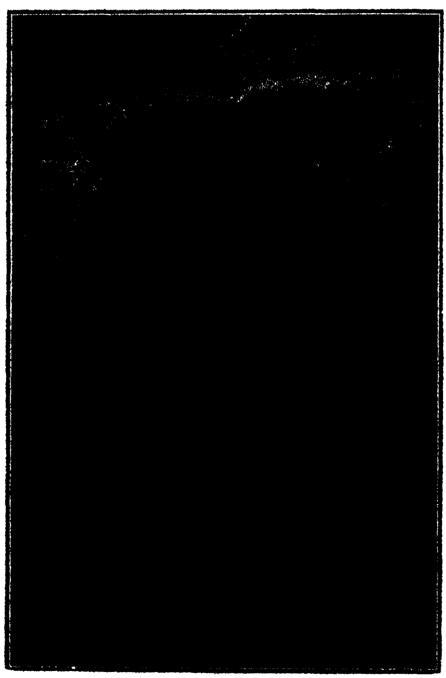
Flying Swarm.

these will increase in number during next summer and help to eradicate the locusts.

Recently a small black fly (at present unnamed) has been observed depositing its eggs on the egg-pockets of locusts. Near Graaff-Reinet this fly was seen walking amongst a swarm of locusts which were busy digging holes in the ground in which to deposit their eggs. This fly is quite tame and can easily be caught, probably because it becomes accustomed to the commotion caused by the locusts fluttering their wings when they are laying eggs. Immediately the female locust extracts its body from the hole in the ground, i.e. before the spume which nature provides for sealing up the egg-pocket, has had time to harden, this fly creeps into the cavity. After satisfying itself that eggs have been deposited it emerges and goes in again backwards,

where it remains some time, eventually coming out and flying away. If an egg-pocket visited by one of these flies were immediately dug up, a few small, elongated, pearl-coloured eggs would be found on the top of the egg-pocket. These small fly-eggs soon hatch and become a pale, ivory-coloured, broad maggot, which devours the locust eggs. This maggot has often been seen before, but the adult fly was unknown until found near Graaff-Reinet, where about 75 per cent. of the locust eggs were destroyed by the maggot.

Birds.—The locust birds that assisted in the locust-destruction work were the European Stork (*Ciconia ciconia*) and the Black Stork (*Abdimia abdimii*). In January and February both these large birds were seen in huge numbers following the flying swarms to the border



Locusts Settling for the Night

of the Kalahari. The absence of open water eventually forced them back, and in March they migrated northwards. The small locust bird (*Glareola melanoptera*) was also seen in flocks in the western Transvaal and Orange Free State. This bird also requires open water, and the abnormal dry season drove it away to places with a more regular rainfall.

In the Cape Province the locust spreeuw (*Creatophora carunculatus*) helped in the destruction of the voetganger, whilst the kestrels and hawks did damage amongst the flying swarms.

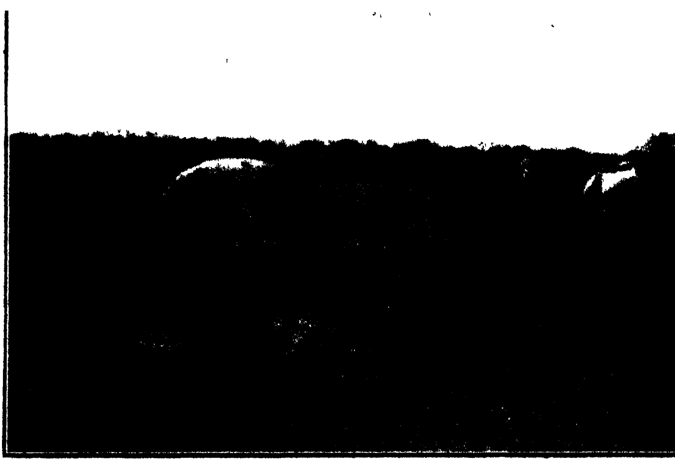
There is no mammal, bird, or reptile that does not relish voetgangers. Some insects even devour them.

Natives are particularly fond of locusts as a food. Thousands of bags of dried locusts are at present in the hands of natives in the districts which were infested.

POISONING CASES.

In spite of the explicit instructions and repeated warnings issued by the Department's officers, a large number of poisoning cases amongst stock occurred, and in one case two native children died as a result of drinking water from a drum that had contained locust poison, and which was alleged to have been cleansed by boiling. Every case of the loss of stock by poisoning has been traced to carelessness and disregard of the instructions on the part of the owner. If ordinary care is taken and the instructions adhered to, the risk is nil.

One point of interest in connection with the poisoning cases is that a large proportion of them occurred in the lamziekte areas, it being asserted by the farmers that the dead locusts satisfy the craving that cattle suffer from in these areas in the same way that decomposed bones do.



Collecting Locusts for Food.

TRAINS HELD UP BY VOETGANGERS.

Through large swarms of voetgangers crossing the line serious delays occurred to train traffic in some districts, more especially in the Prince Albert, Beaufort West, Victoria West, and De Aar Districts. Much of the delay complained of by the Railway Administration would have been avoided had timely measures been taken by the responsible railway official to equip railway gangers and others with pumps and poison.

POISON EXPERIMENTS.

As a result of certain experiments in connection with the poisoning of locusts carried out in the field by Mr. C. W. Mally, Senior Entomologist, Cape, it has been decided to use next season the concentrated arsenical solution without the addition of treacle in a few districts in various parts of the Union with a view to ascertaining definitely whether the addition of treacle is necessary or not. From an administrative point of view there are certain disadvantages in the use of the pure arsenical solution which, however, may gradually

be overcome. They are that (1) the farmers will use the poison far too strong and there will be considerable wastage; (2) as a result of (1) the poisoning cases will be far more numerous even than they are now; (3) it will be difficult to prevent the locust poison being used for purposes other than that for which it is issued.

BREEDING EXPERIMENTS.

Professor J. C. Faure, of the Transvaal University College, who is continuing his studies of the habits of the locusts, has upset the calculations based on the hypothesis that the female locusts lay only one pocket of eggs in their lifetime, by proving that they lay more than one pocket; in fact, one female laid as many as twelve pockets of eggs, with an aggregate of 428 eggs, before she died.

Boiling and Drying Locusts.

DESTRUCTION OF VOETGANGERS BY NATIVES

The Department paid particular attention to the destruction of locusts in the native areas, and, in spite of a certain amount of opposition and reluctance on the part of the natives at first, was singularly successful in its efforts in the Mafeking and Vryburg Districts and in a certain portion of the Bechuanaland Protectorate. The Department's officers, with the assistance of the magistrates and the native commissioner, held large meetings in all the native reserves and gradually obtained the co-operation and support of the various chiefs. After being given demonstrations of spraying and baiting, and having it explained to them that if the poison was used in accordance with

instructions and ordinary precautions taken, there was no danger of their stock being poisoned, the natives withdrew their objections to its use. It is interesting to note that although thousands of swarms of voetgangers were destroyed in the native areas no known poisoning case occurred. A particular word of praise is due to the locust officers of the above-mentioned two districts, who did such good work under such trying conditions.

DAMAGE TO CROPS.

Due to the fact that (1) by the time the swarms that escaped destruction reached the flying stage, a large proportion of the crops had ripened too far to be damaged by locusts, and (2) by means of the intelligence system in vogue, it was possible to warn the farmers that the flying swarms were going in their direction and that they should reap their crops at the earliest possible moment, the devastation was not so serious as was anticipated.

Meeting with Native Chiefs at Motiton, Bechuanaland.

BECHUANALAND PROTECTORATE.

By arrangement with the Protectorate authorities, the Union officers stationed along the Malopo River assisted with the destruction of the voetgangers in that portion of the Protectorate bordering on Mafeking District. The Union officers worked 20 miles inland in the Protectorate and were instrumental in destroying 200 swarms in this area.

FARMERS' CIRCLES.

The farmers' circle system explained below is being adopted in quite a large number of districts, and will, it is considered, be of great assistance to the Department, in that it will ensure the co-operation of the farmers, without which no locust campaign can be successful.

1. The district is divided up by the magistrate into circles comprised of about twelve farms.

2. The farmers in each circle meet and elect from among themselves a chairman.
3. They then agree (whether the locusts are present on all farms or not) (*a*) to assist each other with the destruction of all the locusts within the circle, (*b*) to empower the chairman of the circle to enter upon an alleged defaulter's farm with a view to satisfying the circle that the locusts are not being properly destroyed, and (*c*) to report to the magistrate any occupier within the circle who fails to fulfil his obligations, so that the magistrate may authorize the circle to destroy the locusts at the defaulter's expense or take such other steps as he may deem desirable.

BREEDING-UP PLACES.

As it is now generally believed that a portion of the South-West African Protectorate is a permanent breeding-up place for locusts, in the same way that a certain portion of the Karroo has always been, steps are being taken to review the position in that territory and to devise means for dealing with it.

PROSPECTS FOR NEXT SEASON.

It is anticipated, provided the climatic conditions are favourable for hatching, that there will be a widespread infestation again next season, though its venue may vary a little from that of last season. Some of the districts in the Cape that were heavily infested last season report that no egg-laying has taken place, and it is possible that they may remain free of locusts next season; but in all probability the flying swarms that came in from the Kalahari and flew into the western and northern districts of the Transvaal deposited eggs there, and the campaign next season will be extended to these parts. The magistrates of these districts are fully alive to the position, and have already been asked to and are taking preliminary steps to organize and prepare the districts for a possible campaign. Though next season's infestation may be as intense and widespread as that of last season, it is considered that with every district thoroughly organized and prepared beforehand, which was not the case last season, the destruction of the voetgangers will not present such difficulties, and the turning point will be reached and the locusts got well under control provided the climatic conditions in the territories adjoining the Union permit of the authorities there also conducting a successful campaign.

LOCUST FILM.

The African Films Production Co., Ltd., assisted by the Department, were successful in obtaining unique pictures showing the life-history of the locust and the methods adopted by the Government to combat the pest. The picture will be shown throughout South Africa and should be of great interest to the farming community. The magistrates will be advised of the date on which the picture will be shown in their town in order that they may warn the farmers and enable them to arrange to be present when it is shown.

LOCUST DESTRUCTION, 1920-21.

District.	Number of Officers Employed.	Number of Farms Infested.	Number of Swarms of Voetgangers Destroyed.
Cape			
Willowmore	12	112	1,352
Murraysburg	13	113	3,571
Herbert	15	130	2,074
Carnarvon	4	84	680
Calvinia	1	150	350
Beaufort West	1	117	888
Hanover	1	42	924
Prince Albert	7	224	2,162
Uitenhage	2	15	413
Pearston	4	80	600
Prieska	8	270	5,004
Aberdeen	16	221	4,274
Hay	14	175	1,882
Steynsburg	2	11	47
Victoria West	6	120	2,200
Philipstown	3	80	1,139
Fraserburg...	3	75	150
Venterstad...	2	17	147
Maraisburg	1	70	103
Mafeking	23	300 (3 native reserves)	3,931
Colesberg	3	98	2,747
Somerset East	12	50	3,050
Vryburg	20	361	8,043
Richmond	13	92	3,750
Jansenville	16	183	2,853
Britstown	5	200	4,338
Middelburg	2	72	3,000
Kuruman	1	6	70
Cradock	1	10	70
Hopetown	8	390	4,200
De Aar	5	30	1,100
Namaqualand	2	58	1,270
Laingsburg	1	63	1,050
Burghersdorp	1	19	88
Graaff-Reinet	5	107	4,000
Kimberley	3	55	650
Kenhardt	4	28	350
Williston	1	10	28
Steytlerville	3	146	1,000
Orange Free State			
Jacobsdal	7	320	2,862
Philippolis	5	157	1,618
Bloemfontein	14	485	9,214
Hoopstad	8	500	4,720
Koffiefontein	4	110	1,318
Fauresmith	13	500	7,692
Boshof	14	600	7,272
Bothaville	3	82	1,000
Ladybrand...	1	35	127
Smithfield	1	2	10
Edenburg	1	44	402
Brandfort	6	255	2,067
Bethulie	1	167	920
Winburg	3	36	653
Transvaal.			
Schweizer Reneke...	2	37	287
Christiana	1	5	16
Wolmaransstad	2	198	2,001
Marico	2	8	255
Lichtenburg	1	121	2,700
	336	8,046	118,862

EXPORT OF GRAPES.

Results of Experimental Shipments.

AT the Paarl Viticultural Experiment Station various varieties of grapes are grown with the object of testing their suitability as market grapes or otherwise. During the past season 27 varieties were shipped to London to test their travelling properties. Hereunder is the report of the Trade Commissioner, to whom the grapes were forwarded, on each variety. The figures shown in brackets are some of the prices obtained. The succeeding paragraph, in italics, gives the views of the Government Viticulturist:—

"Resada."—Closely resembles "Flaming Tokai." The fruit was quite sound; the berries were small, but the flavour was very good. (20s.)

When ripe this is a beautiful pink grape; its chief drawback is that the berries are naturally small, requiring a considerable amount of thinning to obtain a fair sized berry. A good grower.

"Schiradzouli Blanc."—This variety, which is practically unknown here, arrived in fairly good condition. Buyers consider that there is no reason why it should not be exported, as it apparently carries well.

Exported for the first time. A good grower. "Rosaki" and "Waltham Cross" preferred to this variety.

"Hermitage."—The cases showed slight waste, and consequently realized low prices. The grape is well known on the market, and is generally the first to arrive, although it is not in the same class as the later table varieties. (12s.)

"Gros Maroc."—The first consignment was in excellent condition, but the second was somewhat wasty. Very bold berries. This variety is the nearest approach to "Gros Colman." A good export variety. (18s.)

This grape is really superior to "Gros Colman" as a grape, but unfortunately it is very susceptible to oidium, and suffers much from sunburn. Where it is not so affected it is really a fine grape. The ordinary sulphuring does not seem to keep the oidium in check, as in the case of other vines.

"Rosaki."—Condition good. This variety is more or less known to the trade, and is considered suitable for export. (12s. 6d.)

"Molinera Gorda."—Condition sound, flavour poor, colour resembling "Red Hanepoot." Salesmen state that this is its chief asset, and no doubt it would do very well in bulk. (18s.)

One of the best red grapes. A very vigorous grower; needs long pruning to obtain a good crop. A very hardy grape of the "Almeria" type.

"Prune de Cazouls."—A black grape. Condition sound. Very bunchy and attractive; berries firm and of rich flavour; should prove a good seller. Both parcels were in good condition. (13s. to 20s.)

A very fine grape; needs a good deal of thinning and trimming. Has not done too well in previous shipments.

"Gros Colman."—First shipment in splendid condition, but the second was wasty and mildew very prominent. Berries were very soft and had become crushed. This variety has not carried well during the present season. It is, however, well known and liked on the market, and seems to have a ready sale. (18s.)

"Barbarossa."—The first shipment arrived in perfect condition, but the fruit of the second showed slight waste and mildew. Certain of the berries had collapsed, evidently through pressure, as in nearly every case the bunches were too heavy. The berries, however, were fine and bold. This grape is well known on the market here, and has a fairly ready sale. (20s.)

"Laubscher's Gem."—Fine condition. Not known on the market, but salesmen see no reason why it should not be exported, as it apparently carries fairly well. (12s.)

A fine dark red grape; berries, medium.

"Barlinka."—Good condition on arrival. Same remarks apply as in the case of "Laubscher's Gem." Should prove a good commercial grape. (10s.)

One of the newer varieties; a good grower and bearer. A very promising grape. Should replace "Barbarossa," as its bunches are smaller and the berries naturally bigger. In a former report it was stated that this grape should be classed next to "Gros Colman" in the dark varieties.

"Red and White Hanepoot."—Condition very good; nice bold berries. (8s. to 18s.)

"Directeur Tisserand."—Condition on arrival was very good, but it is not known on this market. There would appear to be no reason why it should not be exported, as it seems to carry satisfactorily. (18s.)

A fine black grape; vigorous grower; should be further experimented with.

"Gros Noir des Beni Abbes."—Very fine bold black grape; stems a little too hard; very sweet; mildew showing on stalk. (18s.)

One of the newer varieties. A natural fine big berry; when young it is inclined to suffer from nonsetting. Vine seems almost to do better in the bush-form than on trellis. A very promising variety.

"Waltham Cross."—Condition sound. Very fine bold berries, clear and firm; in fact, this was a specially good specimen parcel of this particular variety. (20s.)

"Cornichon Violet de Tivoli."—A very fine grape of excellent flavour; condition good. (18s.)

A dark red grape. When well ripe is similar to "Cornichon Blanc," better known as "Ladies' Finger." Berries just over

medium; a nice loose bunch; does not need much thinning. A good bearer and grower. A variety well worth considering by intending planters.

"Bonnet de Retort."—Condition sound. The berries of this variety are striped and salesmen do not think they would appeal to many, except as a novelty; the flavour was good. (18s.)

"Servan Blanc."—This variety arrived in sound condition. Quality was very good and also the flavour. According to salesmen's opinion, this type of grape should meet a very good demand. (18s.)

Very similar to "Raisin Blanc." The bunches are not so compact.

"Olivette Barthelet."—Condition sound, very fine, bold berries, resembling "Rosaki" and "Almeria." A very attractive white grape, and can claim place with some of the best varieties. (18s.)

A rather late variety; a good grower and bearer. This variety has been exported on a fairly big scale by an exporter at Paarl with very satisfactory results.

"Djovazani," "Malakoff Isjum" (20s.), "Formosa" (20s.).—These varieties arrived in good condition, but are unknown to the trade. Further experimental packs should be sent next season.

"Tribodo Nero."—White grape of good colour and fleshy berries, somewhat like "Waltham Cross," which is well known here and sells fairly well. (20s.)

The vine as well as the grape resembles Hanepoot. A very late grape. A good bearer, but a weak grower.

"Aberkane."—Arrived in fairly good condition, but is not known to the market. Further experimental packs should be sent next season. (20s.)

"Henab Turki."—Similar to "Barlinka," but not very attractive in colour.

This grape has been much boomed by certain growers; it has even been stated that it will revolutionize the grape export trade. Intending growers must remember that this vine needs a warm site for its crop to ripen properly. The vine is inclined to produce a heavy second and even third crop, which must be removed if the first crop is to develop to perfection. The bunches are very close and require much thinning, otherwise they easily rot.

"Almeria."—Very fine type of grape indeed; arrived in splendid condition, and was most highly spoken of by the salesmen. If shipments of this grape could be sent over in similar condition, they would be sold readily at good prices. (12s. to 20s.)

The *Journal* is the Department's medium of making known its activities. It contains information of value to every farmer in the Union Keep it for reference.

LIFE-HISTORY OF THE JACKAL
(*THOS MESOMELAS*).

(Being a report issued by the South African Biological Society based on information received from various correspondents.)

By AUSTIN ROBERTS, Transvaal Museum.

ACCUMULATING KNOWLEDGE.

THE jackal pest has always been so serious a problem to the South African sheep farmer that is seems hardly necessary to introduce the matter at length in the present account of the life-history of the animal. All that need be said is that, despite settlement by Europeans in some districts for a hundred years, during which the jackal has always been an evil to be reckoned with, and has exercised the ingenuity of generations of farmers, elucidation of the problem of how to eradicate it seems as far off as ever. As indicating the seriousness of the problem, it may be stated that the Cape Provincial Administration paid out in rewards during the year ended 30th June, 1920, over £7700, and it is estimated that during the same period about 50,000 jackals were destroyed in that Province by various means. With a view to investigating this problem, Sir Arnold Theiler, Chief, Division of Veterinary Education and Research, introduced the matter to the South African Biological Society for discussion, and as a result it was decided to circulate a list of questions throughout the country, in order to accumulate as much data as possible upon the life-history of the jackal before taking active steps to exterminate it. This was done through the kind offices of the Press, and a large number of replies have reached the honorary secretary of the society from which the following account is drawn up.

The questions circulated dealt mainly with the habits of the jackal, and owing, perhaps, to the lack of detailed inquiry as to the methods commonly in vogue to prevent the ravages of the animal, many of the writers have given little information in this connection. It is, however, the most important part of the investigation, and as proper justice cannot be done to the subject until full particulars are available, it has been deemed advisable not to publish the little information received on this point, but to circulate another series of questions in conjunction with the present account, with a view to the publication of a further report dealing with the remedies thus far attempted. It is hoped that the request for this information will receive the same unstinted response that characterized the first one, when correspondents gave excellent original observations based in most cases upon many years of experience of the jackal pest. The

problem concerns large sections of the farming community and it is only by their combined efforts that any definite results are likely to be obtained. The jackal has long experienced the methods of European settlers and thus being well adapted to elude them, individual, and indeed even small communal, action is not likely to attain the desired end. Hence the necessity for consolidating all the available information in order to concentrate upon the eradication of this serious pest.

THE MOST HARMFUL JACKAL.

The species included by various writers under the name of jackals are: The black-backed jackal (*Thos mesomelas*), silver fox (*Vulpes*

THE BLACK-BACKED JACKAL

chama), long-eared fox (*Otocyon megalotis*), and aardwolf or maanhaar (*Proteles cristatus*). All are agreed that the first-named is the principal cause of the trouble, though the maanhaar is also said to do a little harm, and is generally not considered a menace owing to its scarcity; the silver fox and long-eared fox apparently do little or no harm.* It may be mentioned, however, that some have written about the silver jackal as doing damage, but it would seem from the accounts given that the reference is to the black-backed jackal, to which the following vernacular names are applied by different writers: Red, blackback, silverback, saddleback, silver or silver-tail jackal; rooi, groot rooi, witrug, bontrug, zwartrug, blauwrug or lammervanger jakhals, vos or vossie; of these the commonest name

* Should this prove otherwise, correction should be made.

is red jackal or rooi jakhals. Another species which probably also does damage is the side-striped jackal (*Canis adustus*), but as it occurs, so far as is at present known, only in the low country of the eastern and northern Transvaal northwards, whence no replies have been received, it does not for the present concern us. The following account deals only with the black-backed jackal.

WHERE THE JACKAL IS FOUND.

The replies do not furnish a true indication of the distribution of the jackal in the Union, as they have come from parts only where sheep farming is largely undertaken and where the animal does much mischief. From many other districts no replies were received, and as it is known that in some of them the jackal is still to be found, while in others it has been so harried that it is practically non-existent, all that can be said is that, judging by the replies, the animal is a serious pest only in the Cape Province from the Karroo and karrooide districts northwards to the western districts of the Orange Free State and Transvaal and the great dry districts west of these Provinces; on the east, one district of Natal and the low country of Zululand alone are mentioned. Were we to judge by the silence of farmers from the rest of the country, we might conclude that closer settlement has been responsible for the disappearance of the animal; but, on the other hand, in some of the districts in the Cape Province, where the jackal is very troublesome, Europeans have been in occupation now for over a hundred years, and the only conclusion that can be arrived at is that shelter is afforded there in thorny bush, mountains, or great stretches of unoccupied or sparsely inhabited land, which cannot be properly hunted over.

It is stated in the replies that in many districts jackals are as plentiful now as they ever were within living memory; in two cases, indeed, they are said to have been formerly unknown and sheep were able to remain out at night without injury. In other districts there are said to be fewer jackals than formerly, but those that have remained are more destructive and difficult to capture or kill. In a few districts an increase in number has been noted in recent years.

LOCAL MOVEMENTS.

It is clear that migration in the usual sense does not occur. Many writers state that the jackal is always present in their districts, but that local movements take place, which are expressed in the following replies, chosen from the number received: "Jackals have no fixed abode, but roam about, unless they have young in the neighbourhood." "They generally live in the mountains when not breeding; but in times of drought, or when their natural food is scarce they follow the trekking flocks of sheep from one district to another and devour the dead or weak sheep left out at the resting place of the previous night; thus jackals are brought in from other districts." "When poisoning is carried out extensively they seem to disappear (become much less) on the farm, only to return in from two to four months." "In the past jackals gave a lot of trouble about August, but did not trouble so much after 15th October, it being concluded that they appeared in the district to rear their young and thereafter departed." "One very disturbing influence

is the erection of jackal-proof fencing; the new pens appear to scare them out of the area for a time, but they eventually become accustomed to them and return." "They are usually local, if not hunted or driven elsewhere by hunger; but the young ones when nearly adult are driven away by the old ones." Hunting them down with dogs would seem to have even greater terror to the jackal than the causes above mentioned; but as this would seem not to be carried out all the year round for various reasons, the jackals return again after the terror has worn off by the inaction of the hunters.

BREEDING HABITS.

The period of gestation is said to be about two months. By far the majority of writers concur in placing the breeding season as the latter part of the winter, the young being born from August to October; but a few have noted the appearance of young and found them in embryo in other months of the year. The litter is stated to vary usually between three and seven, sometimes two to nine, some writers stating that they are not all reared successfully, a smaller number being noted to accompany the adults. The young are usually born in holes, otherwise amongst loose boulders, under krantzes, in caves, hollows under flat stones or dry branches washed together in sluits, in old antheaps, or even in holes excavated by the jackal itself under large flat stones. The following notes on the character of the holes occupied are of special interest: "As soon as the young are able to crawl their mother takes them to a small hole where they alone can crawl in; when she returns at night their attention is attracted and they crawl out to her." "In holes with two entrances." "Never in holes in pure earth, always in stony or gravelly places where they would be hard to dig out." "Meercat holes to start with, later moving to larger ones." "In holes that are hidden or partly hidden by bush, never in exposed holes." "Generally near water, and as near as possible to the feeding grounds." Several writers note that upon the least suspicion of the holes having been discovered, the young are removed (even in daylight) to another hole some distance away, and in removing them they are carried in the same way as puppies, by their mother. The mother remains with her young for a time, varying according to different authorities from a few days to a month, after which she remains in the neighbourhood during daylight, and in this way is able to afford them protection by removing them when she suspects or knows that their retreat has been discovered. There are a number of cases noted in which the pups have been observed playing outside the holes during daylight, of which advantage is sometimes taken to shoot them, by lying in wait until they emerge. The part taken by the parents in the care of their young would seem to vary, the female apparently attending to their wants while they are very young, but as they grow older the male also helping to provide them with food. There are numerous records to show that when the young are big enough to eat, the mother disgorges meat she has eaten for their benefit, and as it is claimed that this habit is peculiar to the female, the conclusion is that she alone provides for them while they are very young. It is claimed by some writers that on account of this habit the female is not easily poisoned, the meat being vomited up as soon as the effect of the poison is felt. There are records, however, of both parents and

their young having been poisoned at the same time; but as the age of the young is not stated, presumably this took place when the pups were fairly large. There is much division of opinion as to the age when the pups start wandering with their mother (or both parents), which is natural perhaps, as circumstances must largely govern the departure, and accurate observation upon the point is difficult to secure; the majority estimate the age of the pups at this stage as being from two to four months, a few, however, estimating it at six weeks or even a month. They would appear to remain under parental care until they are from four to six months old (some state as much as nine months), after which they fend for themselves. Up to this time the immature jackals would seem still to retain their habit of remaining during daylight in holes and other shelter, emerging at night to make common cause in the hunt for sustenance.

HABITS OF THE ADULT JACKAL.

When the juvenile habit is shaken off, the jackal finds greater security above ground, hiding in daylight in any convenient cover far removed from its enemies, such as bush, long grass, hillsides or top of ridges where it can observe the approach of its enemies from afar and slink away unobserved. The animal seems nevertheless to display considerable sagacity; often judging it safer to lie close and allow a man to pass within a short distance without disclosing its presence by taking to flight. It finds security also in solitude, seemingly never taking refuge in one place in communities; but at night it is usual where the animal is plentiful for the scattered individuals to get into touch with each other by howling, an advantage when food is to be shared or combination becomes necessary. It is not usual for the jackal to hunt during daylight, although there are abundant records to show that it does so at times, more especially in cloudy, rainy or wintry weather, this being commonly attributed to hunger.

A question was asked as to whether the time of appearance of jackals has any relation to the distance travelled from the daylight hiding place; but apparently the majority of writers do not think it has. The time of their appearance (that is to say, the time when they are commonly seen or heard) varies considerably; but it is most commonly stated that they are often seen before sunset, and most commonly heard after sunset; some writers state that they travel some distance before howling. The female is said to visit her young at the holes before setting out on her foraging, after 4 p.m., and again upon her return early in the morning. The distances travelled at night by jackals are frequently very great, some writers stating that they travel all night, others estimating it at as much as thirty and even fifty miles; indeed, in one case a jackal was shot which was found to have grapes in its stomach, and the nearest place where these could have been obtained was twenty-five miles away as the crow flies, over a mountain range. Footpaths and roads are usually followed in proceeding to the foraging grounds; but success seldom attends efforts to trap them there, as they are too wary and note any unusual disturbance of the ground. The usual pace at which they travel is a dog-trot, five or six miles an hour when they have an objective; but this is interrupted when the animal is in search of food or suspicious,

halts being made to investigate. The distance travelled most likely depends upon the relation of food supply and danger to itself or its young, or to circumstances necessitating its migration to "pastures new." When belated in the morning it travels faster than its wont, and if overtaken by daylight takes refuge in the nearest cover; some state that after a heavy meal, its pace in returning is slower. When pursued it is exceedingly fast and a good dog is needed to course it; it is able to run down hares and the smaller antelopes, and a case is recorded where one ran down a steenbok (*Rhaphiceros campestris*) at 9 a.m. close to a homestead.

THE CALL OF THE JACKAL.

Questions were asked as to the call of jackals and its significance. Many agreed that the calls have a significance, but find it impossible to describe them. There is a concurrence of opinion that the long-drawn howls are the assembly call, best described as "nyah-h-h-h, yah-yah, yah-yah"; when hunting they utter a short, sharp howl, described as "yah yah yah"; when alarmed they utter a yelp like a dog, and when hard-pressed by dogs a grunting sound; a grunting sound was also made by a jackal bitch that chased a writer's dog. According to one writer:—"The mating call is rather pretty, and sounds something like a shrill, hearty laugh from the female, the male giving several long-drawn howls of a deep throaty character." When females are disturbed in the holes with their young they growl at the intruder. One writer has seen three jackals walking together just after sunset, and one (perhaps different ones alternately) setting up a howl at intervals; and on another occasion a single jackal was seen by him standing near a trap after sunrise, and uttering a single drawn-out howl at intervals of about two or three minutes. Another writer states:—"An observant man knows when he hears jackals calling at about sunset on two or three evenings in succession at the same place that their new family has arrived; his business is then to examine the footprints to find if the jackals are both there, and then track them to the nursery."

DIET OF JACKALS.

While essentially carnivorous in its habits, the jackal by no means confines itself to meat. The majority of writers mention rats, mice, birds, hares, young springhares, and buck, besides small stock of the farmers; but a complete list of its menu as recorded besides these is as follows: watermelons, herbs, berries of the "blauwbos," "kruisbesje," "rasyn," "beerkassie," and "witgat"; cultivated fruit, grapes, raisins, prickly pears; dassies, meerkats, tortoises, lizards (never snakes or scorpions), fish, earthworms, locusts, flying ants, insects; dead animals, such as cattle, horses, donkeys, a dead native, and human excrement; korhaans, guineafowls, partridges, young ostriches, ostrich eggs, and other birds' eggs, fowls, geese, and turkeys.

MODE OF ATTACK.

There is a general concurrence of opinion that the jackal is too cowardly to attack a sheep facing it, and ewes have been known to protect their lambs by doing so. When a sheep persists in facing the

jackal, the latter will endeavour to scare the former into flight by making sham charges, running round it, and howling; and if the sheep is foolish enough to bolt, the jackal instantly runs it down, and fastens its teeth in the neck behind the ear on one side, hanging on until the sheep is killed. To show its cowardly nature, several writers record where lambs have mistaken a jackal for their mother, and have run towards it, the jackal became so alarmed that it turned tail and bolted, in one case into an antbear hole, where it was discovered by the herd and killed. Old rams of sheep and goats are said to be seldom attacked, and full-grown sheep not often by a single jackal. Lambs are naturally more often victims than adult sheep, and young calves and pigs also suffer when not protected. Young jackals often attack sheep from the back, missing tails and wounded hindquarters being often seen in consequence. It seems most usual for the jackal to hunt in pairs, though this is by no means an invariable rule, single (usually old and cunning) ones often doing considerable damage, and sometimes more than two combining to hunt, as many as six having been observed doing so. At the time when the young must be provided for, the parents are much bolder, and when the young accompany their parents many sheep are often destroyed, some being killed and more injured, seemingly with the object of instructing the young, or the young themselves being less adept. The love of killing quite commonly results in a large number of sheep being killed or injured even by single adult jackals. The same tactics as with sheep are adopted in hunting the smaller antelopes; hares are also run down, but less agile creatures are first stalked and then pounced upon. Birds are caught at night while sleeping or on their nests on the ground, and in the event of their rising they are snapped in flight. Fowls are taken from the roosts on rare occasions when the jackal is bold enough to venture near the homesteads. Cases are recorded where a single jackal has waited outside a patch of bush, while others have driven out animals hiding in it. One writer records that he once observed a jackal busy digging at a mouse hole, while others stood about ready to catch the mice as they emerged, which mice usually do when the smaller carnivores attempt to dig them out. Rats and mice are said to be quite commonly dug out of their holes, though doubtless many more are captured at night on the surface. Ostrich eggs are broken by the jackal kicking them backwards against a stone; or otherwise an egg is pushed to the edge of the nest and kicked backwards against the other eggs until one may break; an ostrich nest which has been robbed by jackals in the latter case usually has one egg left on that account.

There is a general concurrence of opinion that the jackal will not enter kraals under normal conditions, the exceptions being where it is made bolder by hunger, the kraals some distance from human habitations and not protected by dogs, and the kraals insecurely built of branches or wire. Sometimes an old individual may cultivate the habit of raiding kraals from continued success, and then does much damage by returning at intervals. Instances are known where it has endeavoured to get into kraals by digging under the fence after failing to find a weak place in its construction. Some writers state that it will spring over a kraal wall, another that it will never attempt to enter a kraal, even if the gate be left open; but no doubt these occurrences are a matter of circumstance governed by the height of

the wall, the presence or absence of dogs, and the individual characteristics of the jackals that may frequent the locality.

A question was asked as to the signs by which jackals are known to be in the neighbourhood: The replies most commonly state that the jackal howl is the surest sign, besides which spoor, smell and depredations leave little room for doubt as to the animal responsible for losses. Some state that when the young are with their parents they are all silent, others that they are too wise always to call and the first indication of their appearance on a property is often only the loss of sheep. The presence of young at their retreats is said to be indicated by their spoor, playing places, hair, feathers, and blue-bottle flies.

THE DAMAGE SUSTAINED BY FARMERS.

The annual loss arising from the depredations of jackals within the Union seems impossible to estimate, but must run well into five, if not six, figures. The following statements may be taken by way of example: (1) Has himself lost annually from £25 to £35 in sheep. (2) As many as ten to fourteen sheep have been killed from one flock of sheep in a single night. (3) Of adult sheep, jackals kill one or two in a night, young sheep up to twenty. (4) One to four adult and up to twenty young sheep may be killed in a night. (5) One jackal will kill five to ten sheep in a night. (6) Has had forty sheep killed in a kraal at intervals by an old jackal before he was brought to book. (7) Has had as many as sixty sheep or more killed in one year. (8) Has known a bitch and two pups to kill twenty-three lambs in one night, more for sport or training than consumption. (9) Has lost as many as forty sheep in one month through jackals.

Little is said about the loss of other live stock, a few mentioning goats, fowls, geese, turkeys (as many as twelve are recorded to have been killed in one night), and young ostriches, pigs and calves, the great cause of complaint being the enormous damage done to sheep in particular, the losses in which far outweigh all the rest put together. Many writers state that the damage is done at all times of the year, but is at its worst when the young jackals must be provided for, which coincides with the presence of lambs. Some state that cold weather stimulates their appetites, others that during times of drought and general scarcity of food jackals become much bolder and do greater damage. It is also said that after a certain amount of damage has been done, special efforts are made to destroy the jackals, which has the effect of killing some and driving the rest away. Doubtless these sporadic efforts to exterminate the jackal also coincide with increases in the number in neighbouring districts.

The loss sustained does not depend upon the number of sheep actually destroyed, but is enormously enhanced by the extra labour required for shepherding, erection of special fences, necessity for action to destroy the jackals, deterioration in the health of the sheep by the greater increase of scab arising from their being closely herded together, or general debilitation arising from the sheep being driven to and fro. The veld is said also to deteriorate on account of the numerous footpaths to and from the kraals becoming gutters during

floods of rain. Altogether the jackal has exacted a heavy toll from the country.

THE HARDY JACKAL AND THE REMEDY QUESTION.

All writers express the same opinion that to-day man and his dog are the only natural enemies that the jackal has to fear. Disease (except mange in old individuals) is stated to be unknown amongst jackals by all writers, with the exception of Mr. F. Bowker, Thornkloof, Albany District, who gives an instance of his dogs having contracted a disease, after tackling a sick jackal, from which they died. Two of his brother's dogs, moreover, contracted the disease from the sick dogs and also died.

Opinions are divided as to the prevalence of parasites on jackals, but ticks, fleas, and lice are mentioned as having been found on them in many cases.

FURTHER INFORMATION NEEDED.

Much still remains to be recorded of the methods employed by individuals and communities to destroy the jackal, so that it is found necessary again to appeal to men of experience for information thereupon. To publish at this stage of the investigation the little data that have come to hand in this connection does not seem advisable until all the available information can be collated. It may be stated that at present there appears to be a considerable divergence of opinion as to the efficacy of the different methods employed; and when it is considered that varying conditions of environment, climate and settlement, characterize the huge area concerned, it is hardly a matter of surprise that methods found entirely satisfactory in one district fail altogether in another. Information on this point is of primary importance. Farmers are accordingly earnestly invited to give the Biological Society the value of their experience by corresponding with it on the lines set out hereunder. They are reminded that the greater the amount of detail contained in their accounts, the more likely are they to assist themselves and their confreres; also that strict adherence to the questions is not desired so much as important facts that can be made use of and that may perhaps not appear in this list. In replying, however, tabulation will be facilitated by retaining as far as possible the same order as the questions.

(1) *Hunting.*

Full details would be of great utility as to the methods found most advantageous in each district in conducting hunts, such as the nature of the veld, the number of men required and available on foot or on horseback, number of fire-arms required or commonly used, positions taken up by the men, number, breed, and training of the dogs, and how they are controlled; whether drives are conducted in a line towards "voor leërs," or a large area surrounded; whether some seasons are found more suitable than others for conducting hunts, and the reasons why; whether a practice is made of examining all holes that may be discovered in the course of the drives for traces of spoor into them, and whether these are dealt with at once or not when

found to be occupied. Do jackals lie close when drives are in progress, or do they bolt as soon as they observe what is toward, or ever take refuge at once in holes? What results have been obtained with foxhounds under different conditions of climate and environment? How many packs are in existence in the neighbourhood?

(2) *Fencing.*

What fences have been found to be really effective in keeping out the jackal? Are the fenced areas only small ones in the midst of large unfenced tracts of country, or are they contiguous? How is the maintenance of fencing affected by floods, conditions of climate, soil or animals burrowing underneath them? Would fencing of wards or other large areas be effective, having regard to the occurrence of roads, railways, and rivers, where slackness in vigilance or other uncontrollable factors might permit of jackals sneaking through? What is the general opinion of farmers in regard to their sharing the burden of fencing?

(3) *Poisoning.*

What poison is used and found to be most effective? In what way is it put out? What precautions are taken against raising the suspicions of the jackal? What time of day, and what season, are found most suitable for putting out poison? Is poison left out permanently, or are places where it is put carefully marked so that it can be removed from time to time? Do jackals often carry the poisoned bait for some distance and then drop it, or are such cases exceptional? To what extent has it been found that the sex or age of the jackal affects the usefulness of poison? What factors operate against the employment of poison, such as the destruction of dogs, stock, game or other animals, in which it must be remembered that some of the smaller carnivores are useful in keeping down the undue increase of rats and mice? Is it possible to judge in any way what effect the poison has upon the actual destruction of the jackal or other carnivores?

(4) *Trapping.*

What kind of traps are found to be the best? Have attempts been made to trap them alive in double-fenced enclosures, with sheep or female jackals placed in the inner one? Is bait used or not and if used, what bait is found to be most attractive? What conditions of environment and weather are found to be most suitable? At what time of day is it found best to set the traps and visit them, and what precautions is it necessary to take to secure the best results? What advantages and disadvantages are there in trapping? Is it found that too much time is taken up by the distances to be traversed, interference by thieves, rusting of metal, destruction of other animals, damage to stock, to make it worth while trapping? Are natives to be trusted not to turn the traps to other purposes, or does the reward offered induce them to do their best?

(5) *Destroying Jackals in Holes.*

Are holes on the farms marked in any way so that they can readily and systematically be examined at the breeding season? When

holes are found to be occupied, how are the jackals destroyed, by terriers and hounds, digging, gassing, poisoning, or trapping?

(6) *Shooting.*

What guns are used? Does it pay to sit up at night for them on roads jackals frequent on "drags," or at their kills? Have "bull's-eye" or "bulala" lamps been tried and found useful, or is it found that other animals are more often killed?

[*Replies may be sent to this Office or addressed to Dr. Phillips, Honorary Secretary, S.A. Biological Society, P.O. Box 820, Pretoria.* —EDITOR.]

Poultry Division A Demonstration, Grootfontein School of Agriculture.

Outbreaks of Animal Diseases: July, 1922.

Disease.	Transvaal.	Natal.	Cape.	Orange Free State.	Transkei.	Totals for July, 1922.	Total, Calendar Year, 1921.
East Coast Fever	—	3	—	—	5	8	212
Mange	9	—	13	1	4	27	272
Anthrax	34	5	6	10	7	62	1557
Dourine	—	—	8	—	—	8	50
Glanders	—	—	1	—	—	1	8
Tuberculosis	2	—	—	—	—	2	10
Epizootic Lymphangitis	—	—	1	—	—	1	6

CODLING-MOTH CONTROL IN FRUIT SHEDS.

By F. W. PETTEY, Ph.D., Entomologist. Elsenburg School of Agriculture.

A CONSIDERABLE number of fruit growers who possess large orchards have reported that codling-moth infestation of the fruit has increased to an alarming extent in recent years, regardless of spraying with the correct mixture as often as officially recommended. The writer, after investigating conditions in a number of these large orchards, has concluded that the serious state of affairs has arisen through several causes.

Within the last few years these large orchards have attained their fullest bearing capacity. The enormous increase in crop and acreage to cover with the spray wagon, has not in many cases been satisfactorily met with in a corresponding increase in competent supervisors for the work. The result has been that constant satisfactory supervision of native sprayers in the orchard has been sacrificed necessarily for supervision in the packing and drying shed. Natives cannot in most cases be expected to spray thoroughly and correctly without constant attention from a European.

Fruit growers handling large crops find it difficult to harvest and store all fruit as soon as it is mature. The longer mature fruit is left on the tree, the longer it is exposed to infestation, and the more codling larvae escape from it in the orchard to increase the number of moths forming the next generation. The longer late maturing fruits are left on the trees, the more larvae escape, hibernate in the orchard, and increase the infestation the next fruit season.

Some growers either have too few labourers to give attention to the regular picking up of infested windfalls, or they do not consider such fruit to be of sufficient value to warrant storage. Allowing such windfalls to remain on the ground results in the escape of so many more codling larvae in the orchard to aggravate infestation, not only in the season's crop, but in that of the succeeding year.

Another factor which is by far the most responsible for serious infestation in large orchards, is the tendency to utilize more and more the infested fruit for drying, with no attention whatever to storage of such fruit to ripen in a room so constructed that larvae leaving the infested fruit may be captured, or in order that moths emerging ultimately in the fruit shed may be prevented from flying to the orchard.

The practice of allowing thousands of wormy fruits to remain in piles, or in open boxes, or in drying trays either out-of-doors, under trees, or in open sheds while ripening sufficiently for drying, could not be more effective for increasing codling infestation in the orchard, unless measures are taken to capture the escaping worms. Thousands of larvae leave such fruits, resulting in as many thousands of moths ultimately flying to the nearby orchards. Many of these moths may

go to the orchard when the fruit is large, and therefore difficult to keep covered with poison (1). Hundreds of adult codling-moths that developed from larvae hibernating in the fruit shed at Elsenburg were found flying in the fruit storeroom as late as the first of January this year, the time when the third application of lead arsenate had already been applied in the orchard! Californian fruit growers have reported the capture of thousands of moths in their fruit sheds (2), (3).

In the Elsenburg fruit storeroom a very successful trap has recently been erected to capture all larvae leaving infested fruit while it is waiting to be cut up for drying. This trap (see figure 1) has, in two months captured over 3000 larvae from a comparatively small amount of infested pears. The structure is very simple, consisting of a narrow board 1¼ in. wide and ½ in. thick, nailed firmly to and

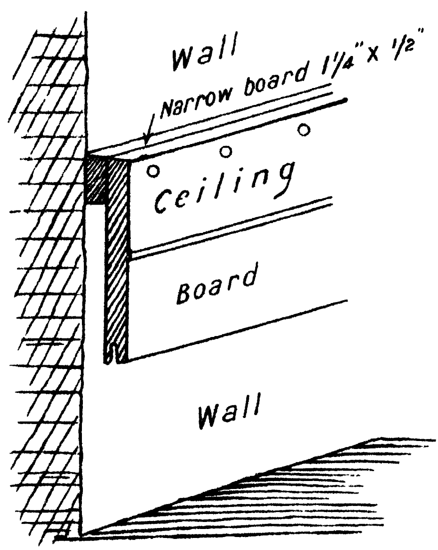


Figure 1

along the top of one side of a ceiling board. Both boards, firmly fastened to each other, are then screwed tightly against and along each wall of the storeroom, parallel with and two feet from the floor, and are so attached that the top edge of the narrow board is level with the top edge of the ceiling board, the tongue of which has previously been planed away.

They are put in such a position that there is a space the thickness of the narrow board between the lower two-thirds of the ceiling board and the wall of the room. Narrow strips of bagging are stuffed in this space to serve as an attractive place of shelter for the codling larvae. Tree tanglefoot, a material similar to fly-paper tanglefoot, is then placed along the top of both boards to prevent any possibility of larvae crawling over the trap, up the wall to the cracks in the wood of the ceiling. The structure is screwed to the wall in wooden pegs driven into holes drilled in the wall.

The trap can be erected in any fruit storeroom, providing the walls, up to a height of about two feet, are smooth and without cracks, preferably of brick covered with cement. Fruit growers who have storerooms with walls of corrugated iron may, with comparatively little expense, construct a low cement wall along all sides of the room, to serve as a place of attachment for the trap. In order that the trap may have maximum efficiency, the floor of the room should be smooth and solid, preferably of cement. No boxes, tables, or trays should be stored or left in the room, and the infested fruit should be placed in a pile on straw on the floor, along the walls, and kept there until ready to be cut up for drying, or fed to pigs. No more infested fruit should be removed from this room than can immediately be cut up. Infested cores, which result from the cutting of the fruit, should either be placed in a receptacle of boiling water or caustic soda solution for a short time to kill surviving larvae, or deposited in a square cement receptacle, open at the top, with the trap placed along the walls, until carted away to be fed at once to pigs.

The trap may be somewhat improved by having the narrow board at least an inch thick, and the ceiling board so attached to the narrow one that the top edge of the former is a little higher than that of the latter. The tanglefoot may then be smeared only on the top of the narrow board, the higher ceiling board thus preventing the tanglefoot from running down the sides. Although there is not much difficulty in pulling out the bagging in order to kill the larvae, getting at the larvae which sometimes spin cocoons in the corners of the boards, and frequently in the grooves along the lower edge of the ceiling board, may be facilitated by having the ceiling board attached to the narrow one by hinges or buttons for easily lifting the former to remove the larvae.

All larvae should be removed from the trap once every two and a half weeks until the middle of February. After this time the larvae need not be removed until the end of the fruit season, as they do not develop into moths until spring.

To make the most use of the trap, windfalls should be regularly picked up and placed in the storeroom for infested fruit, and not left on the ground in the orchard, until larvae have escaped, a bad but frequent practice. Picked fruit should be sorted in the packing room as soon as possible after being carried to the fruit shed, and the infested fruit at once placed in the storeroom for wormy fruits. Fruit should be picked as soon as mature, because the longer it is left on the trees, the more larvae escape in the orchard from the infested fruit on the tree.

Such a trap need not be necessarily limited to the fruit storeroom. Fruit growers having no storeroom available for infested fruits, and who are accustomed to place the wormy fruit, to be cut up for drying, in piles on the ground under branches of trees, may use the trap to good advantage, providing a suitable wall, e.g. one of brick covered with cement, two feet high, is erected, to enclose the pile of fruit. The enclosure should have a cement floor, and be so constructed that the floor can be washed occasionally. The trap should be placed along the inner walls of the enclosure.

The longer experience the writer has in dealing with the control of codling-moth in large orchards in South Africa, the more convinced

he is of the necessity of fruit growers to adopt those measures of control supplementary to spraying, mentioned in this article and a previous one (4), chiefly because native sprayers cannot be relied upon to spray efficiently.

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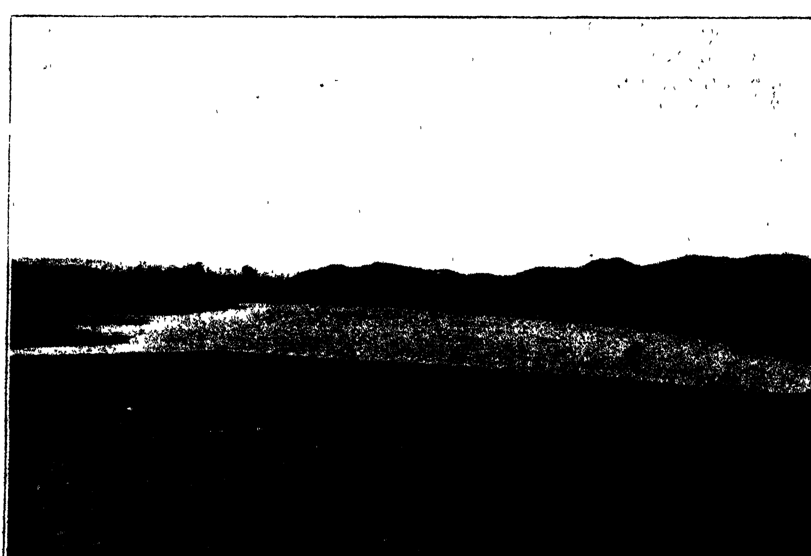


Water Conservation in the Karroo.

NAGANA AND THE TARTAR EMETIC TREATMENT.

By H. H. CURSON, M.R.C.V.S., Veterinary Research Officer in Charge of Investigations into Nagana in Zululand.

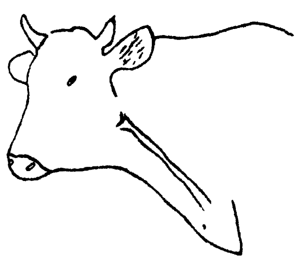
Symptoms and Course of the Disease.—Any of the symptoms to be described may be noticed first, but there are usually several indications to guide one. A beast may show a staring coat, or be doing something that calls for attention at once, e.g. it may be standing motionless in the bright sunshine while its companions are lying down in the shade, or it may be the reverse, the remainder of the herd might be grazing and the suspect remains lying down showing no inclination to move. There may be a watery discharge from the eyes, or the eyeballs may appear slightly sunken. A good indication is the reaction of the eyes to light, for a nagana beast seems less inclined to face the bright sunshine, and blinking is therefore a common symptom. The muzzle may be dry. Sometimes the faeces watery. In some cases all there is to guide one is that the faeces are black, pointing to the eating of earth, especially ant-heap. After grass has been burned, it may be noticed that the faeces are black through ingestion of burnt grass particles, showing that one must be guarded in forming conclusions. In other cases, there may be traces of blood in the faeces, and one would suspect enteritis. There may be lack of energy, especially noticeable in trek oxen, or a lessening or even complete cessation of milk yield in cows; there may be drooping of ears, a nasal discharge or salivation, and, in a few cases, a cough has been the first indication of something amiss. Sometimes all that can be noticed is a loss of condition, which, however, is not always progressive, for several animals have been observed to fall away, then regain condition, and after a change of weather, e.g. a cold spell, again lose flesh. A common attitude of resting is, when lying down, to place the lower jaw on the ground as if the neck was not sufficiently powerful to support the head. Cold weather, particularly when accompanied by rain, is a good time to pick out suspects, for owing to anaemic changes, nagana sufferers seem to feel the cold more than other animals. Dropsical swellings in the throat, chest, or abdominal regions may occasionally be observed, and it is noteworthy that these disappear as suddenly as they manifest themselves. There may be a loss of appetite, but it is remarkable that rumination is hardly affected, as in the case of other diseases.

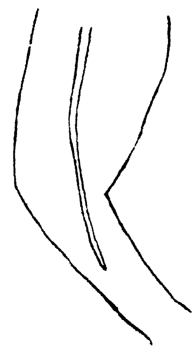
As the disease progresses, more information is to be gained by examination of pulse and temperature, the latter being marked by periodic transient elevations, and the former being characterized by a loss of tone. As time advances, the beast loses condition rapidly, the animal is hide-bound, coat staring, belly tucked in, and back arched, while the expression on the face is one of anxiety. There may appear, and again disappear, opacities on the cornea and the conjunctiva of the eye, and the mucous membrane of the mouth is usually pallid. In time the gait is affected, being weak and staggering, and, unless kept at the kraal, a beast will topple into a donga

or generally at the drinking place, where, in their eagerness to get water, the stronger members of the herd push the weaklings out of the way. In some cases the accidents that occur, such as falls, are due, not to weakness, but to blindness, and even in such advanced cases treatment may bring about recovery.

Method of Preparation of Tartar Emetic Solution.—Doses: *Adult cattle*, one and a half grammes given daily on five consecutive days. At this Laboratory, larger doses, two grammes, and even two and a half grammes, are given to large oxen, and up to the present time no harmful results have been noted. *Donkeys* may be given one gramme to one gramme and a half. *Dogs* of 25 lb. weight take 100-125 milligrammes of the drug with safety. *Horses and mules* receive the same dose as bovines. Regarding repeated administration, one must necessarily use some discretion, for should an animal show alarming symptoms after an injection, then either the following inoculation should be postponed for a day or two or the dose decreased:—

The tartar emetic powder (which is obtainable from all chemists) is placed into a bottle containing normal saline





SEATS OF INJECTION.

Left side of neck showing position of jugular vein.

Inner aspect right hind limb of dog showing course of saphena vein.

solution which has been prepared beforehand by adding ordinary coarse salt to rain-water in the proportion of 1 teaspoonful of salt to 1 pint of water. For each 1 gramme of tartar emetic measure off 20 c.c. of the saline solution, thus, in preparing five doses of 1½ grammes each, one would take 150 c.c. of liquid. Place a plug of cotton wool or clean muslin in the mouth of the bottle, which stands in a saucepan containing cold water. Bring the water in the saucepan to boiling point, and allow this to boil gently for half an hour. After this interval the tartar emetic solution may be considered sterilized, and the bottle may be removed from the saucepan and allowed to cool to body temperature. If particles of the powder are still visible at the bottom of the bottle, a little shaking will cause it to dissolve. In inoculation of the dog, 2½-5 c.c. of the normal saline solution is advised.

Seat of Injection.—The safest and easiest channel for administration is the intravenous, the jugular vein in the case of large animals, and the saphena vein in dogs. The sketches above show the sites usually selected.

Method of Securing the Patient.—As tartar emetic produces necrosis and abscess formation when injected under the skin, it is necessary that an animal be securely held for the operation. Should even a few drops collect under the skin, a swelling will form. For this reason it is advisable to cast all subjects, but an experienced inoculator may succeed in performing the operation in the standing position. The usual method of throwing bovines or equines is to have four natives, one standing at the head, another holding a riem which has been placed about the fore limbs just above the fetlock joint. The third, standing on the same side as the second boy, grasps a riem attached in the same way around the hind limbs, and the fourth native, placed on the opposite side of the animal, holds a riem which has been fastened about the trunk of the animal, passing under the belly and over the loins. On a given signal all pull simultaneously, giving a slow but sure tug which causes the animal to fall with as little effort as possible. The fore and hind limbs are next approximated and tied together, enabling one man to hold these. The riem around the body is next removed, and the two boys thus made available grasp and so steady the withers and loins. It is recommended that a log be placed under the neck so as to increase the prominence of the jugular vein. In the case of the dog, it is held down on its side and the hind limb nearest the ground is relaxed and pressure is applied in the groin. This has the effect of making the vein conspicuous and the injection is facilitated.

Method of Inoculation of Drug.—After thoroughly washing the seat of inoculation with brush, soap, and water, the vein is made prominent by pressure, at the base of the neck in the case of the jugular vein, and in the groin as stated above for injection into the saphena vein of the dog. The needle of the syringe (which is kept aseptic in a dish of boiling water) is then introduced under the skin immediately above the vein, its point being directed downwards and backwards. As soon as the operator is satisfied with the position of the needle, he plunges it into the vein immediately below, and, if successful, blood issues at once. The syringe containing the solution is next attached to the needle and the contents *slowly* injected into the vein. When the syringe is empty, remove it and again cause blood to flow from the needle. This has the effect of removing all traces of tartar emetic from the inside of the needle, so that when it is withdrawn no material is deposited under the skin. Other points which may seem simple, but are of practical importance, are—

(*a*) do not have a needle with a long point, for unless one is sure that the needle is well into the vein, accidents may happen, e.g. blood may flow from the needle, yet only three-quarters of the point is actually in the vein, and when tartar emetic is being injected a quantity of the liquid may escape into the surrounding tissues;

(*b*) do not use the same needle to fill the syringe from the bottle and then immediately afterwards to introduce it under the skin. First place it in boiling water to remove all traces of tartar emetic or, better still, have at least two needles.

(*c*) If a needle containing blood is placed into boiling water, there is a tendency for the blood to coagulate and so reduce

the lumen. It is advised to remove the blood by first cleansing in cold water.

(*d*) Always choose a site for the throwing of animals where there will be as little dust as possible.

(*e*) Animals seem to stand the injections more satisfactorily when they are not fatigued, e.g. by driving or exertion, in throwing during cool part of day, and, finally, as mentioned above, when the solution is injected slowly.

Effects of the Drug. Local.—If the injection has been properly carried out, no untoward results are to be feared, and a careful operator may make all his inoculations into the one vein. If, however, tartar emetic has found its way under the skin, a swelling will form, the size depending on the amount of escaped liquid. The following day the site of inoculation in such cases will be firm and painful. The termination will be either—

(*a*) swelling will gradually become smaller until it finally disappears;

(*b*) there will be an increase in size, varying from an egg to a cocoanut, until an abscess is formed; or

(*c*) the swelling will remain circumscribed and firm, and after several months appears to shrink, although never to such an extent that it could not be detected by manipulation. This fact should be borne in mind when cattle are put up for sale.

Occasionally, in abscess formation and necrosis, the vein itself becomes involved, the walls degenerating and thus necessitating surgical removal of as much as five inches of the blood vessel in bad cases.

If fresh solutions of the drug are used, swellings are less likely to form.

Effects of the Drug. General.—In therapeutic doses, apart from the action on the trypanosomes in the blood (which disappear half an hour to three hours after injection) no systematic effects are observed except perhaps a little respiratory distress, or increased pulse rate. If, however, animals have been well handled and all precautions taken, no alarming symptoms should be manifested.

In doses that are larger than those advised previously, the breathing is shallow and hurried, pulse rate increased to over a hundred, trembling of muscles, especially of forequarters, lowering of head, sweating, and disinclination to rise or move.

Number of Injections Recommended.—In early cases, one dose may be sufficient, but as a routine measure, five are given. For animals that have survived without treatment, one or two Nagana seasons—October to March, when most cases of natural transmission occur—and are consequently much reduced in stamina, as many as ten inoculations have proved ineffective. There may be a temporary improvement in such cases, but a relapse usually ends in death. Careful observation is always necessary for *the most reliable guide as to whether tartar emetic has been effective or not is the condition of the animal.* So long as there is improvement all is well, but

reinoculations are necessary as soon as one of the many early symptoms of the disease are recognized. It is emphasized that an animal, although improving, may still act as a reservoir of infection. It is obvious, therefore, that all infected and suspected animals be segregated and treated at weekly intervals while biting flies are abundant.

In concluding these few remarks on the administration of tartar emetic, I would point out that at the present time, there is as far as I am aware, no other drug to compare with it for the following reasons:—

(1) Tartar emetic is most efficacious in sterilizing the peripheral blood stream.

(2) It is at the same time easily procured.

(3) It is cheap, being only 6s. 6d. per pound.

(4) In reliable hands, it is safe.

(5) It is easily administered.

(6) Trypanosomes do not appear to acquire resistance to its action readily.

Continued Investigations into Nagana.—Successful as tartar emetic treatment has been, I still feel that more valuable results can be obtained; and in this direction it is not unlikely that maximum quantities of tartar emetic, quinine and sodium arsenite, each given on successive days by the intrajugular route will be found most beneficial. It is hoped to carry out tests with these drugs as soon as possible.

In addition to the work carried out in connection with treatment, many experiments have been undertaken to ascertain differences in virulence of various types of trypanosomes, to discover whether infection takes place in utero, also to investigate other matters of scientific importance.

Roots Getting into Pipes.

Vitrified clay pipes and cement pipes are being used considerably now for water mains and drainage pipes from farm buildings, such as stables. If there are any trees growing close to the lines of pipes, and the joints between the tiles have not been properly made the roots of the trees will sooner or later get into the pipes and so effectively choke the pipes that water will not flow through them any longer. It is therefore important that during the laying of the pipes all the joints be perfectly made. If the tiles are of the "socket-and-spigot" type, a cement mortar should be used at the joints, and the joint well filled in, as otherwise the roots will get through. If the tiles are of the "Hume" pattern, i.e., straight from one end to the other, and they are to be joined by means of a collar or sleeve fitted around and over the junction between the tiles, then the mortar should be well stuffed in the space between the pipe and the collar, for the same reason.

APPARENT INFERTILITY OF THE SOIL AROUND TREES.

By C. O. WILLIAMS, B.Sc., A.R.C.S., Chemist, School of Agriculture, Cedara.

IT is a common practice in Natal and other parts of the Union to plant belts and clumps of trees in order to provide shade and shelter for the farm animals, and incidentally as a direct source of revenue as well. It is very noticeable that little in the way of crops can be grown contiguous to these trees. In fact, a zone may be observed on each side of a shelter-belt of wattle trees in which absolutely nothing grows within the first few feet from the trees, and the crop improves progressively as we recede from the shelter-belt, until at the maximum distance of roughly twenty yards, on the average, we find that the crop reaches the ordinary standard of growth observed in that field.

SUPPLY OF LIGHT AND AIR.

Several theories have been advanced to explain this apparent infertility of the soil near trees, and as the effect varies with the distance from the trees, up to a particular point, it is obvious that the deleterious effect is due in some way to the presence of the trees. Some put it down to the shade of the trees cutting off the supply of light and air, but this cannot be the true reason, or at least not the chief one, for the barren strips are observed on all sides of a shelter-belt or clump of trees, and extend to a greater distance from the trees than where the shadow usually falls. Also, there is generally sufficient light, even in the shade of the trees, for assimilation in the leaves to go on vigorously; in fact, it has been shown by experiment that ordinary daylight can be reduced to one-twelfth its intensity without any ill-effect. Pickering, the late Director of the Woburn Experimental Fruit Farm, by erecting canvas screens to simulate, and even exaggerate, the shading effect of trees, proved that a crop under them gave exactly the same values as on the unshaded ground. As for the question of supply of air, the shelter-belts as a rule are not so thick as to prevent free circulation of air, and the fact that the barren strips occur on the side facing the permanent winds to the same extent as on the sheltered side contradicts this theory.

TWO OTHER THEORIES.

Another cause of the barrenness advanced by some people is the probability that the trees have deprived the soil in their vicinity to a very large extent of the available plant-food. A third supposed cause is based on the assumption that the soil solution near the trees contains an excess of mineral salts, owing to the ground having been unduly deprived of its moisture, thus bringing about too great a concentration of saline matter in the soil-water in that neighbourhood for the good of the crops. These last two assumed causes are, however, rather contradictory, for if the trees have drawn exhaustively

on the stock of soluble mineral matter in the soil it is not likely that even the smaller proportion of water present in the soil near the trees would become appreciably more highly charged with mineral salts than the water in the soil away from the influence of the trees.

In order to test the validity of the theory mentioned above, viz., the undue deprivation of soluble plant-food by the trees, a series of samples of soils were taken (1) in the immediate vicinity of four different wattle belts and plantations on this farm, and (2) at an appreciable distance (about 20 or 30 yards) away from the same belts and plantations. A complete chemical analysis of all these samples was made, and the results, when closely compared, do not show any distinct evidence that the roots of the trees had appreciably deprived the soil near them of plant-food as compared with the composition of the soil 20 or 30 yards away.

With the object of testing this theory further, the amount of water-soluble matter in each sample of soil was ascertained, and the results again show no greater amount of soluble plant-food in the soil away from the trees than immediately under them.

With regard to the contention that the soil solution near the trees contains an excess of mineral salts, the results obtained do not bear this out either, for, although allowing for the smaller amount of moisture in the soil in the vicinity of the trees, the concentration of mineral matter in the soil-water there would not be anything like enough to be harmful.

SCIENTIFIC EXPLANATION.

Most scientists who have studied this question seem to be of the opinion that the sole, or at any rate the main, reason for the barrenness of the land in proximity to a plantation is the deprivation by the trees of the moisture of the soil through which their roots range. When it is comprehended that the limiting factor governing the fertility of South African soils is generally moisture (as witness the large increase of crops from lands when put under irrigation) this question becomes of considerable importance.

In a soil of good physical texture the roots penetrate to a great depth and ramify to a considerable extent outwards, and when we consider the enormous amount of moisture transpired by an average sized tree through its leaves, it is realized that a belt or clump of trees will deprive the soil in its immediate neighbourhood of water at a tremendous rate, especially during a hot, dry, windy day. The amount of water exhaled by a tree would depend chiefly on the amount of leaf surface and on the number and size of the stomata or leaf pores, so that some kinds of trees tend to deprive the soil of its moisture at a far greater rate than others. For instance, poplars are often planted in swampy areas in order to dry out such localities by the rapid pumping of the water through their roots, up the stems, and finally out through the pores of the leaves into the surounding air. During the last summer a crop of pumpkins was grown in a field contiguous to a wattle shelter-belt on this farm. The season was a dry one, and it was soon noticed that the portion of the large-leaved crop near the trees did not make such good growth as that at an appreciable distance away. Furthermore, during the hot afternoons the leaves of the plants near the trees were all limp and drooping, but regained their usual turgid appearance as soon as the cool evenings came on. During

the day these large leaves transpired more moisture than the roots could take up from the depleted stock of water in the soil, but as the evening approached the supply of water from the soil again equalled the demand of the leaves. However, as the season advanced, the supply of water in the soil near the trees became so small that the pumpkin leaves there took on a permanent wilt, and finally the plants nearest the trees died off completely, although the crop in the centre of the field was quite a good one.

MOISTURE ABSORPTION BY TREES.

In order to ascertain to what extent the trees will dry up a soil, samples were taken under one of the shelter-belts previously mentioned and also at a distance of about 50 yards from the trees. The sampling was done at the beginning of January, during the rainy season, but there had been a week of dry weather previous to that date, thus ensuring that no recent storms or showers of rain had caused a temporary acquisition of moisture to the soil near the surface. The field contiguous to the shelter-belt had been cultivated in the spring and kept clean, thus making certain that there was no loss of moisture by transpiration owing to the presence of weeds or a crop.

The total amount of moisture in each sample was immediately estimated, which gave the combined percentage of both hygroscopic and capillary moisture in the soil under normal conditions. This soil is a reddish, heavy clay loam, of excellent physical and water-retaining properties, and from previous estimations it was found that the amount of hygroscopic moisture (i.e. the amount of moisture still left as an exceedingly thin film round each particle in a thoroughly air-dried soil) it is capable of holding is roughly 5 per cent., so this amount is taken from the total in each case in order to have some idea of the amount of capillary moisture present, for this is the moisture from which plants are able to draw their supply. In fact, during a period of drought, even before all the capillary moisture has escaped from a soil, plants will show evident signs of wilting, and when there is only the hygroscopic moisture left the crops will soon die from the want of available moisture.

From the results of the first experiment made in connection with this point it was found (see table) that there was approximately 50 per cent. more capillary moisture in the soil away from the trees than under them, although the shade and shelter of the trees would naturally tend to conserve the moisture in the soil there.

This experiment was repeated a fortnight later in the same neighbourhood, and although a heavy storm or two had taken place in the meantime, a week of dry weather was allowed to elapse before samples were taken in order to ensure that the distribution of moisture in the soil had approached normal conditions again. This time, samples were taken at regularly increasing distances from the trees, and the results in Table 3 show that there is a continuous increase in the moisture-content of the soil up to the maximum distance of 20 yards from the trees, although the increase in the last 10 yards is but small. The amount of capillary moisture in the surface soil at 20 yards from the trees was as much as 80 per cent. more than that in the surface soil under the trees, but the increase in the sub-soil was practically the same as in the first experiment, viz., a little under 50 per cent. Judging from the appearance of the crop on a neighbouring portion

of the field, the progressive increase in the moisture-content of the soil seemed to tally very closely with the continuous improvement in the appearance and amount of the crop as one came away from the trees, and the crop did not reach full normal growth until a distance of 20 yards was reached. This certainly tends to bear out the above contention that the difference in amount of growth is due chiefly, at any rate, to the difference in the moisture-content of the soil. The deep-rooted trees would be able to obtain the moisture they require from a considerable depth in the sub-soil, but this depletion of the underground supply of water would prevent a sufficient amount being drawn up to near the surface by capillary action for the needs of the neighbouring crop.

Another Aspect.

There is, however, another aspect of this problem which should be mentioned. Pickering and some American authorities maintain that some plants have a toxic or poisonous effect on other plants growing in their immediate vicinity. It was found at Woburn, for instance, that the effect of sowing grass round apple trees was to arrest all healthy growth and absolutely stunt the trees. In a series of experiments Pickering also showed conclusively that the leachings from the soil in which certain plants were growing had a marked deleterious effect when allowed to percolate into a fertile soil in which a healthy and vigorous crop was growing. The latter crop immediately showed the poisonous effect of the leachings: it did not continue its former vigorous growth, but became stunted and showed every sign of a toxic action going on in the previously healthy soil. Whether the roots of a plant secrete toxins, or whether these are produced during the decomposition of the vegetable matter from the plant, is undecided, but that a deleterious action goes on when some particular plants are growing alongside others seems to be proved by these and other experiments of Pickering. Not only does he maintain, as a result of his researches, that such a shallow-rooted crop as grass will adversely affect a deep-rooted plant or tree, owing to the formation of toxins by the former, but that grass and other surface crops may be adversely affected by trees for the same reason. He instances the case of some apple trees having an injurious action on a crop of brussels sprouts planted between them, which he puts down to some toxic effect of the trees on the vegetable crop, but it is not clear whether he had completely satisfied himself that the adverse effect was not due largely, at any rate, to the result of the trees depriving the surface soil of an adequate supply of moisture. In fact, Hall, a former Director of the Rothamsted Experiment Station, refers, in his book on "The Soil," to the experiments at the Woburn Fruit Farm of planting fruit trees and sowing the seed of meadow-grasses and vegetable crops at the same time, and maintains that the injurious effect of the grass and vegetable crops on the newly planted trees is due to the fact that the quickly growing surface crops deplete the soil of moisture at the most critical season for the trees, when they are making their first start in their new quarters, and when they are but indifferently supplied with water-collecting roots. It is obvious that for a season or two these roots are few in number and have a very restricted range, and the trees are consequently very ill-fitted to compete with a crowd of fibrous grass roots surrounding them for the

necessary supply of water. Hall also quotes one experiment which showed that the amount of moisture in the top foot of a pasture was found to be only half that present in the same depth of neighbouring uncropped land.

When trees, however, have become firmly established and have thrown out a ramified and elaborated system of roots to a considerable depth, it is quite obvious that the tables will be turned, and a plantation of such trees will deplete the sub-soil of so much moisture before it is able to reach a shallow-rooted crop near the surface that the latter is unable to obtain sufficient for its growth and well-being. Hilgard, the great soil investigator, refers to the great draft made by the blue gum (*Eucalyptus globulus*) upon soil-moisture in California, where, on account of its rapid growth, this tree has been largely used for windbreaks. It was found that the trees deplete the adjoining fields of moisture for about 30 feet on either side, so as to materially reduce crops within that limit. For this reason he mentions that the pine and the cypress have of late found greater acceptance for this purpose, for the narrow types of leaves on these trees conduce to a minimum amount of transpiration and loss of soil-moisture in contradistinction to the action of the broad leaves of the gums.

MOISTURE EXPERIMENTS.

(1) *First Experiment, carried out at beginning of January*, 1922.

	Amount of Moisture.				Percentage Increase of Capillary Moisture.
	Under Trees.		50 Yards Away.		
	Total Per cent	Capillary Per cent.	Total Per cent.	Capillary Per cent.	
First 9 inches ...	18·0	13·0	25·0	20·0	54 per cent.
Second 9 inches ...	19·1	14·1	25·1	20·1	43 „
Third 9 inches ...	20·3	15·3	25·5	20·5	34 „

(2) *Second Experiment, carried out a fortnight later.*

	Amount of Moisture.								Percentage Increase of Capillary Water.
	Under Trees.		5 Yards Away.		10 Yards Away.		20 Yards Away.		
	Total Per cent.	Capillary Per cent.	Total Per cent.	Capillary Per cent.	Total Per cent.	Capillary Per cent.	Total Per cent.	Capillary Per cent.	
First 9 inches ...	15·7	10·7	17·2	12·2	23·2	18·2	24·2	19·2	80 per cent.
Second 9 inches ...	19·7	14·7	20·1	15·1	25·1	20·1	25·7	20·7	41 „
Third 9 inches ...	19·3	14·3	22·1	17·1	25·2	20·2	26·0	21·0	47 „

PRINCIPAL AGRICULTURAL ACTS OF THE UNION.

I.

An Outline of the Diseases of Stock Act, No. 14 of 1911.

THE ACT.

THE first portion of the Act deals with the importation of stock into the Union. No stock may be introduced unless a permit is previously obtained from the Principal Veterinary Officer, or unless in the case of special regulations being published they are complied with. Animals from oversea are quarantined at the seaport for 28 days at least, and cattle are subjected to the tuberculin test, and any which react are immediately destroyed, or may be returned at the owner's expense. But when imported from any country which has an approved Government Testing Station (and the station at Pirbright, England is the only one such at present) cattle may be admitted if they have been isolated 28 days, and thereafter satisfactorily passed the tuberculin test and sent forward direct for shipment. [See Act (Amending) No. 25 of 1916.]

Where stock have lawfully entered the Union (through the prescribed sea or inland ports of entry) and are found infected, or suspected of being infected, with disease, they are liable to destruction or removal, or retention under certain restrictions; if unlawfully introduced they are also liable to destruction without compensation.

The second portion of the Act regulates the movements of stock within the Union. The first feature is that any outbreak, or suspected outbreak, of disease must immediately be reported by the owners of the stock to the authorities, who will issue instructions as to the isolation and treatment generally of the stock in question. The land on which such diseased animals are found will then be regarded a "suspected area," and thereafter (if the suspicion is confirmed) declared an "infected area." The situation and extent of such areas are published in the *Gazette*. Where public roads are concerned conspicuous notices to that effect, stating the disease, are displayed. The declaration of "infected areas" is a dominant feature, for the movement of stock within or out of such parts of the country is subject to stringent precautions, and can only be done under permit; even the individual may be prevented from leaving the area. The removal, except under permit, of the carcass or any part thereof of stock that has died, or is suspected of having died, of disease, is not allowed; all such must be burnt, buried, or disposed of according to regulations. Where a farmer finds stock on his property which may have strayed or been illegally moved from a suspected or infected area, he must isolate them and report the occurrence to the nearest magistrate or other official, and the owner of such stock will be liable for any costs incurred. In the same way, any one finding stock in an infected area must isolate same and report immediately. The impounding

of stock, infected or suspected, is prohibited without the permission of the Principal Veterinary Officer.

Stock found infected with the undermentioned diseases will be treated as follows:—

> *Glanders.*—Destroyed; and the other stock subjected to the mallein test, and those reacting also destroyed.
>
> *Tuberculosis.*—Destroyed; and other stock that have been in contact may be subjected to the tuberculin test, and those reacting may be destroyed, isolated, or otherwise dealt with by the official.
>
> *Lung Sickness.*—Destroyed; and other stock that have been in contact will be inoculated or drenched if considered necessary.

Compensation, according to the schedule included in the Act, is payable for all stock destroyed in terms of the above-named diseases.

The third portion of the Act provides for the carrying out of the following measures:—(*a*) To prohibit or order or permit the removal of stock from place to place; (*b*) order the burial or disposal otherwise of stock, and prohibit the removal of any carcass or portion thereof; (*c*) destroy or otherwise deal with, without compensation, any stock illegally removed; (*d*) destroy any stock infected or suspected of being infected, on payment of compensation which, however, is not payable in the case of East Coast fever; (*e*) order the inoculation, dipping, spraying, or otherwise disinfecting; or the branding or muzzling of stock; (*f*) order the dipping of sheep and goats; (*g*) prescribe routes for stock, close routes, and suspend traffic of stock along any route; (*h*) burn grass or grass-hay in infected or suspected areas; (*i*) prohibit the removal of anything likely to spread disease; (*j*) direct the manner of reporting disease; (*k*) prohibit the holding of any live stock market, fair, or show, and the sale or purchase of stock where such is likely to spread any disease; (*l*) order the disinfection of markets or any place where stock has been confined, and any railway rolling stock for the conveyance of animals; (*m*) use any abattoirs for the destruction of stock, and construct abattoirs; (*n*) order the disinfection of hides or any articles likely to spread disease if the same have been in a suspected or infected area; (*o*) prohibit the removal within or introduction into the Union of the blood or any part of stock suspected or infected with disease; (*p*) order a farmer to construct a dipping tank, or, on his failure to do so, construct it at his own expense. (Provision is made in another Act for advances to defray the initial cost of such tanks.)

In giving effect to the above powers, the Minister or any officer may enter upon any land, premises, vessel, or vehicle within the Union, and any resistance thereto is punishable.

The Act has a schedule showing the scales of value to be applied in assessing compensation. The amount claimed from the Government is determined by a Government veterinary officer or, if desired by the claimant, by a board consisting of a magistrate or field cornet and two landowners.

Any one in a suspected or infected area found collecting ticks, etc., or who moves any cattle, or in any part of the Union is found

in possession of such ticks, etc., for the purpose of wilfully spreading disease, is liable to imprisonment for ten years, and the onus to disprove such charge rests on the accused.

Finally, this portion of the Act provides the penalties for contravention of the Act and the regulations, defines the procedure of charges, outlines the scope of the regulations, and allows for investigations into the diseases by authorized persons in freedom from the Act and its regulations.

THE REGULATIONS.

The chief object of the regulations is the effective control of disease in infected areas and in the immediate vicinity of infected areas, and this control is mainly exercised by the restriction of the movements of cattle within such areas. The veterinary officers in consultation with the magistrates of the districts concerned are responsible for the issue of cattle removal permits, while in certain districts vigilance committees composed of local farmers have been formed for the purpose of advising the Department as to controlling the issue of such permits. The veterinary officer is guided by the recommendations of these committees in districts where they exist before deciding on the issue or refusal of a permit.

The regulations provide for the immediate reporting of all outbreaks of contagious or notifiable diseases within the Union to the nearest government veterinary officer or police post. The locality concerned is then visited by an authorized official and the owner of the stock advised, by written order, as to the declaration of the locality as a suspected area (or, if the suspicion is confirmed, an "infected area") and as to the isolation of stock thereon. Such an area remains in quarantine until circumstances allow of its removal, which must also be advised by the written order of an official.

It is also the duty of any owner or person in charge of stock travelling along a public road immediately to report any case of illness or death of any stock to the magistrate, Government veterinary officer, or justice of the peace of the district, area, or ward, or at the nearest police station or police post, and also to the resident owner of the land on which the sickness or death has occurred; the owner or person in charge of such stock is responsible for the proper burial or destruction of dead animals.

A Government veterinary officer is empowered to cause any stock of a private owner to be destroyed for the purpose of making a post-mortem examination where such stock is infected or suspected of being infected with disease. In such cases compensation is paid, excepting that no compensation is paid in respect of East Coast fever.

THE VARIOUS DISEASES.

While the method of reporting diseases and the regulations governing the issue of permits in infected areas may be similar, the regulations for the control and eradication of the different diseases vary considerably. These diseases (notifiable under the Act) are accordingly detailed hereunder, together with the special regulations concerning each:—

Anthrax.—No one must be allowed access to any animal suffering from anthrax excepting the person who has to care for it or the one

empowered to examine it; all diseased carcasses must be burned or buried and the spot fenced in; any one having been in contact with such carcass or discharge from it must effectually disinfect his person and apparel; all excreta, etc., from an animal suffering from anthrax must be buried or burned, and the spot must be properly disinfected. Owners of "in-contact" animals must cause them to be inoculated if required by the Principal Veterinary Officer.

The power exists, and is exercised, to enforce regulations even more stringent than those extant in order to obtain effective control in any district where the disease is spreading to such an extent as to cause alarm or anxiety.

Tuberculosis.—Any one in charge of a cow or any bovine animal apparently suffering from tuberculosis must report the matter, and keep the animal isolated until its disposal has been directed by a Government veterinary officer. No tuberculin may be imported or sold or used for testing stock except under authority. Animals suffering from the disease, and those reacting to the tuberculin test may be destroyed at the instance of the Government veterinary officer; otherwise they may be branded and rigorously quarantined for a period previous to being slaughtered. Such animals that stray may summarily be destroyed. Carcasses or parts thereof of infected animals must be burned or otherwise destroyed. No milk of tubercular cows may be sold, and any one discovering the presence of tubercule bacilli in milk must immediately report the occurrence to the Government veterinary officer. The stall or place occupied by an infected animal must not be used for any other animal until it has been properly disinfected.

East Coast Fever.—The whole of the Transvaal, Natal, and the Transkeian Territories has been declared an "East Coast Fever Area," but in that large area (and outside its boundaries also) such land or premises on which an outbreak occurs is declared an "infected area." No one may move without permission any cattle in these areas, though the Government veterinary officer may order them to be moved to another part thereof. No hoofs or hides may be removed from an infected area unless disinfected, and then only under permit, nor may they be moved within that area except under permit. Likewise, no grass, grass-hay, moss, or other vegetable matter may be sent out of the area without permit. The movement of cattle from or into such area is prohibited, excepting under written permission of an authorized person. The death or slaughter of any cattle in an infected area must immediately be reported by the owner. Cattle straying or otherwise moved into or from such area may be destroyed, where they cannot be secured and isolated, so as to prevent the spread of the disease. In an infected area it is the duty of those in charge of cattle to prevent their straying out of the area whether it be fenced or otherwise. Nor may cattle be removed to any property adjoining an infected area without a permit; and a false statement made in applying for any permit respecting the movement of stock is punishable. No person may slaughter cattle in an infected area without written permission.

In the wider boundaries of country, referred to above as the "East Coast Fever Area," no person may move, permit, or cause

to be moved any cattle within such area, or into, out of, or through any such area without a permit, and any cattle moved therefrom are liable to being branded. As in other cases, owners must immediately report any case of illness or of death in their cattle; while grass, etc., may not be moved from or within the area without a permit. The magistrate of any district within the area may take a census of the cattle therein, and every owner is required to facilitate this work as far as possible, nor must cattle in such a census area be slaughtered without permission. The same precautions as shown in respect of infected areas must also be exercised to prevent the straying of cattle.

In Natal and the Transkei no cattle may be moved from one place to another unless they have been regularly dipped or sprayed, and are freed from ticks, and proper arrangements have been made for their regular cleansing.

A permit granted for the movement of any stock must be shown on demand, and its conditions must be complied with, and all statements made in obtaining such permit must be true. All cattle may be seized where they are being moved without the provision of the required permit.

The keeping of cattle in towns or on town lands within an infected area is subject to special regulations: they must be kept in approved places, the grass or bush of the area must not be used as food or litter; deaths must be immediately reported; they are subject to slaughter, dipping, or spraying in the event of the disease appearing among them; and the removal in such event of manure, litter, etc., is strictly prohibited. These conditions do not apply in the case of animals grazing on infected town lands which are properly enclosed and provided with a dipping tank.

The regulations show clearly the procedure to be followed in the dipping and disinfection of stock in areas where this is ordered; the strengths of the arsenical solutions are detailed, also the various intervals of dipping, etc. The latter is carried out under the direction of officials appointed for the purpose, to whom the farmer must look for guidance and instruction. In native reserves, etc., where dipping tanks are not available and where dipping is ordered, the cost of the operation is met out of a levy. Any official so authorized may inspect any dipping tank and take a sample of the dip being used; it is punishable to use a dip under the strength defined in the regulations.

The introduction into the Union of grass and similar material of any nature calculated to spread the disease, whether used as packing for any article or otherwise, from any place or country where the disease exists, is prohibited, excepting in such cases where permission is granted.

The above regulations do not apply to any cattle passing direct by rail through an infected or suspected area, provided they are not detrained in any such area.

Additional to the above, special regulations and Minister's orders are issued from time to time as occasion requires, and apply to particularly defined areas; Minister's orders are served on owners of cattle for the erection of dipping tanks and for the regular dipping at specified periods of the cattle on certain farms.

Foot-and-Mouth Disease.—This disease does not exist in the Union, but the regulations provide for any outbreak in respect of the

isolation of the stock, disinfection of those coming in contact with the disease and of articles affected. No stock may be introduced from any country in which the disease exists. At present this prohibition rests on importations from the Netherlands.

Lung-Sickness or Pleuro-Pneumonia.—All cattle that have been in contact with others suffering from the disease are to be isolated by the person in charge, and shall not be released until after inoculation if this is considered necessary by the Principal Veterinary Officer; their quarantine runs for a pericd of three months. Cattle affected with the disease may be ordered to be slaughtered, nor is it permitted for any unaffected part of the carcass to be sold, excepting if it complies with public health requirements.

Rinderpest or Cattle Plague.—This disease is also non-existent in the Union, but in event of its outbreak, regulations exist in the same way as foot-and-mouth disease for the isolation, disinfection, and other measures designed to stay the progress of the disease and eventually to eradicate it.

Swine Fever and Swine Erysipelas.—No pigs affected (excepting those passing through by rail) may be moved out of an area declared infected without the written permission of the Principal Veterinary Officer, nor must any person have access to diseased animals excepting those who have to care for them. No one who has been in contact with such animals may leave the place until their person and apparel are disinfected. Pigs that have been in contact with infected ones are to be quarantined for not less than thirty days; and no manure or litter may be removed unless it has been treated to the satisfaction of the Government veterinary officer.

Mange in Equines.—Every equine affected with mange must be isolated and treated according to the direction of the Government veterinary officer, and if in his opinion the animal is incurable he may order it to be destroyed. No equine must be allowed to enter the stall of an infected one unless the place has been disinfected, nor may an infected equine be placed in any other stable than its own. No harness or other material used in connection with an infected animal may be used for a clean one unless same has been disinfected: if the Government veterinary officer considers that disinfection is impossible the articles must be buried or burned.

Epizootic and Ulcerative Lymphangitis.—The same precautions generally as prescribed for mange above, apply also in this disease.

Trypanozoonosis.—Horses, mules, donkeys, cattle, sheep, goats, or dogs are not allowed into or out of an infected area, excepting that the movement of uninfected animals is allowed under permit issued by the magistrate, subject to the approval of the Government veterinary officer.

Rabies.—This disease does not exist in the Union. In the case of outbreak, infected animals and those suspected must be destroyed forthwith and the bodies buried or burned. Any animal bitten by an infected one must be secured in isolation and kept under observation for six months.

Glanders and Farcy.—No equine must be placed in a stable, etc., that has been occupied by one showing symptoms of the disease or reacting to the mallein test until the infected animal has been removed and the stable, etc., disinfected, and the litter, harness, and stable articles of any infected or reacting equine must be destroyed or disinfected as the Government veterinary officer may direct.

Sheep-Pox.—This disease does not exist in the Union. The regulations provide for the disposal of the carcasses of infected animals, disinfection, and quarantine, etc.

Dourine.—Equines suspected of infection must be isolated and the Government veterinary officer immediately notified, who will issue instructions as to the proper isolation of all stallions and mares on the farm where dourine infection exists. Any mare infected will be destroyed and the owner compensated, while infected stallions may, at the option of the owner, either be castrated or destroyed, with compensation. The owner or any person in charge of a farm where dourine exists, must take such precautions to eradicate the disease as instructed by the Government veterinary officer.

SCAB IN SHEEP OR GOATS.

While the laws in connection with the foregoing diseases are administered by the Veterinary Division, those concerning scab are carried out by the Sheep Division, and the chief features are briefly outlined hereunder.

Every owner of land on which sheep (sheep also mean goats in the regulations) are running must provide thereon a circular tank, as prescribed by the Department, with the necessary appliances for dipping of sheep.

An authorized dip is defined as a lime and sulphur dip, and by Government Notice No. 1034 of 1921 there was added to the definition any manufactured lime and sulphur dip, provided it is guaranteed as non-injurious to sheep and wool and is sold under such guarantee of composition that when diluted ready for use the tank fluid shall contain not less than 1.5 per cent. of polysulphide sulphur. (The following proprietary dips comply with the above regulation, viz.: "Capex," "Champion," and "McDougall's lime and sulphur dip.")

A sheep inspector may at any time inspect any sheep within his area, and the owners must render all reasonable assistance in such examination and dipping of the sheep. If the owner fails to do so, or conceals any sheep, or negligently fails to produce all the sheep or to provide any necessary dipping materials or utensils as ordered by the inspector, he is liable to punishment.

For the purpose of cleaning up certain districts where scab exists, the Minister may order a compulsory dipping of all the sheep therein, but may exempt sheep that have been free from scab for twelve months. During the period of compulsory dipping no movements of sheep may take place in such area until they have been twice dipped, or the owner holds an exemption certificate or a permit from the inspector, which may be granted to enable such

sheep to be removed to a dipping tank for the purpose of being dipped. No sheep may be moved into such area except on a permit. All such dippings must be carried out under supervision of an inspector.

Whenever an owner finds or suspects that his sheep or goats have become infected with scab, he must report the fact to the local inspector in writing, and the report must be handed to the officer personally or sent by registered post. It may be handed to a magistrate, native commissioner, postmaster, justice of the peace, or police officer for transmission to the inspector, but then the owner must obtain a receipt therefor.

If the sheep are in a non-protected area (that is, a locality not free of scab) the owner must, *after reporting*, cause the whole of the infected flock to be dipped, except that if the outbreak occurs in winter and the weather makes it dangerous to dip all the sheep, he must dip those visibly infected and thereafter, from day to day, all sheep which become visibly infected until it is possible to dip the whole flock. If the sheep are in a protected area (that is, a locality free of scab) after reporting the outbreak, the owner must wait for seven days, and if the inspector does not visit his flock within that period, must dip the flock once (or if it is winter then as described above), and on his arrival the inspector will administer two further dippings. This is the only exception, otherwise in protected or semi-protected areas no dipping for any cause whatsoever is allowed without prior permission from the inspector.

In all cases, to dip sheep means actual immersion of the sheep in the dipping mixture, and the hand-dressing in lieu of such dipping is prohibited.

Where it is reported to him or he becomes aware of the existence of scab, the inspector will quarantine the infected sheep and order the owner to cleanse them within thirty days by dipping them twice; the first dipping must be administered within seven days of the order, and the second within from eight to ten days of the date of the first dipping. He may give extension of time for the first dipping if it is dangerous to dip on account of cold weather, or if the sheep have long wool so that they may first be shorn. There is a condition, however, that all visibly infected sheep must be dipped at once; also the total period allowed for cleansing must not be exceeded.

If the owner fails to dip the sheep as ordered by the inspector or if the sheep after dipping are found to be still infected, the owner is liable to prosecution. If the stock is dipped and found clean within thirty days the inspector may raise quarantine.

An inspector may undertake the dipping of any infected sheep at the expense of the owner.

Whenever the inspector supervises the dipping of infected sheep they must be dipped in the "authorized dip." If not procurable the owner may choose the dip, but the dipping will be at his risk.

MOVEMENTS OF SHEEP.

Movements of clean sheep only are allowed; they may be moved without a permit, except in the following instances: For movements

from a non-protected into a semi-protected (that is, a locality partially free from scab) or fully protected area and from a semi-protected area into a fully protected area, a permit must be obtained from the inspector of the area from which the sheep are moved. The owner must make application for this permit in writing to the inspector, and must declare that the sheep concerned are free from scab, and that they have not been in contact or intermixed with infected sheep, or depastured on land infected with scab within six weeks immediately prior to application. He must further state the number of sheep and (as they must be twice dipped under supervision of the inspector of the protected or semi-protected area into which they are moved and must remain there in quarantine in the meantime) also where he wishes to dip his sheep and if he has permission from the owner of the farm where this is to take place.

Sheep moved from one protected area to an adjoining protected or semi-protected area or from a semi-protected to an adjoining semi-protected area may be exempted from the dippings, but a permit is required; also from a protected area to a non-contiguous protected or semi-protected area or from a semi-protected to a non-contiguous semi-protected area, if the sheep are moved by rail and are not detrained except for watering purposes.

No sheep may be moved from the area under control of one inspector to that of another inspector until such time as the owner has given notice to the latter inspector of his intention.

If sheep are illegally introduced into a semi-protected or protected area the inspector may order their return to the border of such area.

No sheep may be moved within or from any restricted area except upon a permit from a sheep inspector. This restricted area is confined solely to the Transkeian Territories, where the peculiar difficulties necessitate special precautions.

If scab breaks out among any travelling flock the owner must notify the nearest inspector and the owner of the land on which the sheep are, and proceed to the nearest tank where the sheep must be dipped. If the inspector does not make his appearance or issue written instructions, the owner may then proceed with the sheep to the next available tank and administer the second dipping within the prescribed period of eight to ten days. The owner must notify each inspector through or into whose area he moves his sheep.

Every owner of land who has a dipping tank must keep it in proper repair.

These are the main features, but the regulations provide for eventualities not mentioned above. In order to comply with the law wherever he is doubtful of its application, the farmer should immediately get in touch with the sheep inspector of his district, for the essence of the regulations lies in the prompt reporting of outbreaks of scab, whether suspected or actual.

Note.—Those desirous of studying the full text of the laws principally concerned, should obtain Acts No. 14 of 1911, and No. 25 of 1916; also Government Notices Nos. 637 and 638 of 1915, and (for Scab) Nos. 1702 and 1703 of 1919.

PISÉ-DE-TERRE.

By P. B. AIRD, Engineer, School of Agriculture, Cedara, Natal.

IN a description of constructional work, such as pisé-de-terre, illustrations assist in forming correct ideas, and the accompanying photographs may serve this purpose.

No. (1) shows lack of uniformity, the result of carelessness, and indicates the necessity of placing not more than 4½ inches of earth in the moulds, so as to measure 2⅝ inches when compressed. The faults shown in the photograph are due to placing excessive quantities, thus resulting in layers of 5 inches to 9 inches thick, which have not been properly compressed. This emphasizes the desirability of not exceeding the quantities mentioned.

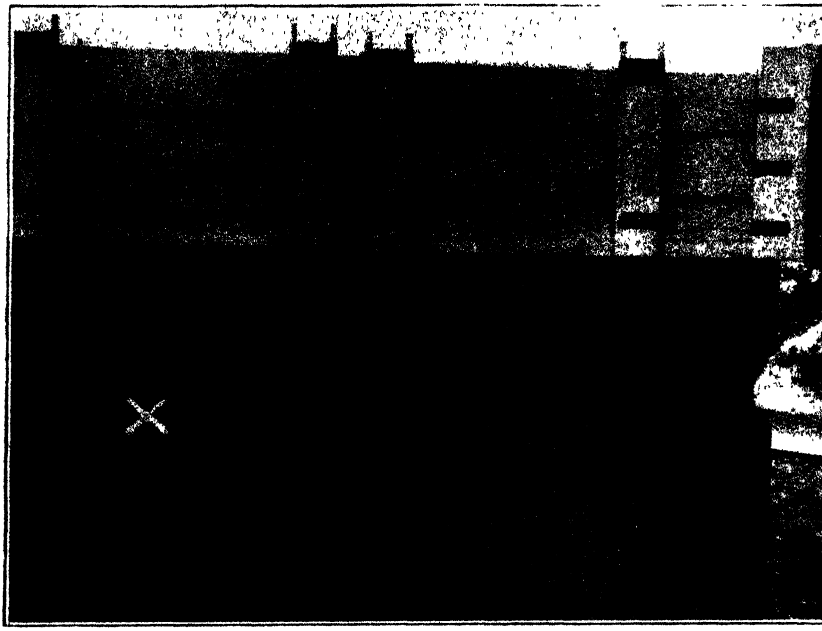
This photograph, whilst displaying the result of defective work, also shows to advantage the rounded corner and the arrangement of the shuttering at close quarters. Owing to the defects it was decided to level the whole structure, and this was only accomplished with difficulty. A 16-lb. hammer proved abortive, and it was ultimately necessary to use pick-axes and remove the layers. Two or three hundredweights of the best compressed material thus obtained were retained as samples for distribution, the balance being resifted and utilized in reconstruction. The resultant compressed layers of 2⅝ inches proved very satisfactory.

No. (2) shows a corner of the building—the uniformity of the layers can be traced, also the method of preparing a keyed surface to receive plaster, cement, lime, or "dagga." The wires are also shown which hold down the wall plates. Cement plasters 9 to 1 and 12 to 1 were tried without success. Blue-lime plaster 4 to 1 (4 parts sand to 1 part blue plaster lime) was tried with a certain degree of success. The outside of walls were plastered over with the same kind of earth used for making the walls, but in conjunction with a mixture of two parts sand to one part "dagga." Finally, the surface was treated with two coats of Polar Bear Compo, and a satisfactory result was obtained, as shown in photograph No. (3).

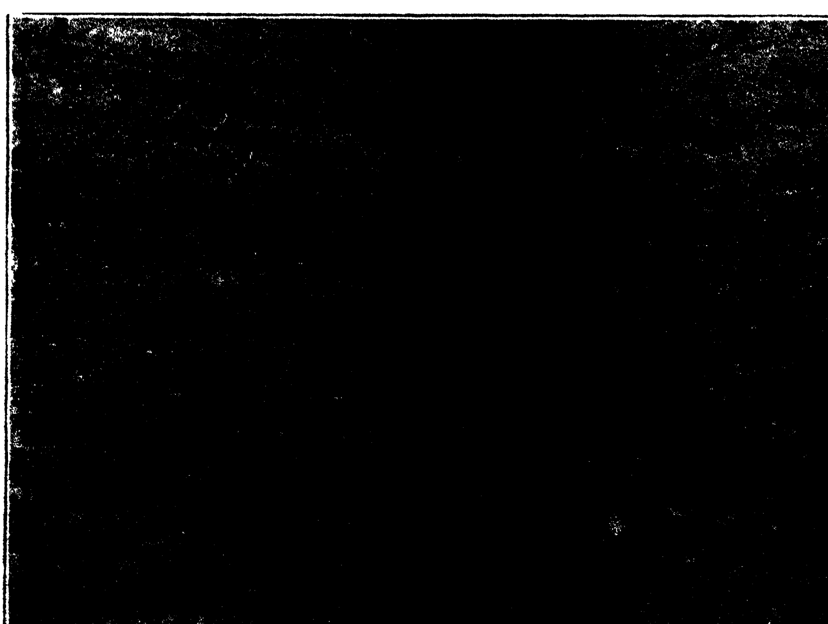
Although quite a lot of pisé-de-terre work has been carried out in various parts of Natal, it should be stated that a Mr. Goldie, of Escombe, has had exceptional experience, and has constructed at least three fairly large dwelling-houses, with their outbuildings, etc. Some photographs of his work are given, which show to particular advantage his shuttering and working tools. In photograph No. (4) the tools are displayed, and it is advanced by Mr. Goldie that a wooden rammer (marked 4) when used as a finisher makes a better keyed surface for receiving the successive layers than the bricklayer's hammer.

No. (5) shows the inside corner-piece, door, window, and break-joint stop end.

No. (6) shows the shuttering. In this photograph attention is drawn to the rough surface finish of the walls, and the contrast between this and the walls shown in photograph No. (7) should be carefully noted.



Photograph No. (1).



Photograph No. (2).

No. (7) shows the effect of using machined timber and well-braced shuttering.

Mr. Goldie's average of work accomplished confirms the writer's own experience that three boys should do two cubic yards of well-rammed walling per working day of nine hours, and, owing to the heavy nature of the work, a wage of 3s. per day per boy is reasonable.

The following is a list of the usual everyday questions with answers:—

Question No. 1: What type of earth must I use for pisé-de-terre?

Answer: A soil which contains very little clay (less than 25 per cent. good).

Mechanical analysis of two earths used in pisé-de-terre by C. Williams, B.Sc., A.R.C.S., School of Agriculture, Cedara:—

	No. 1, Good. Sample from F. A. Dumat's Farm. Per cent.	No. 2, Fair. Sample from School of Agriculture Farm. Per cent.
Coarse gravel	Nil.	10.8
Fine material	100	89.2
Analysis of Fine Material:		
Hygroscopic moisture	1.3	3.9
Organic or volatile matter	4.6	10.7
Fine gravel	1.1	9.9
Coarse sand	6.1	2.6
Fine sand	13.9	13.5
Silt	22.6	10.7
Fine silt	41.1	22.5
Clay	8.4	25.1

Question No. 2: What thickness of material must I place within the shuttering previous to ramming?

Answer: Not more than 4½ inches and not less than 2 inches.

Question No. 3: What kind of rammers must I use?

Answer: Pisé-de-terre means compressed earth, and to obtain best results you must have weighty rammers; rammers similar to those in the plan* or those used by Mr. Goldie [see photograph No. (4)] will compress the earth to perfection. Rammer marked 4, when used as a finisher, will do excellent work and replace the bricklayer's hammer.

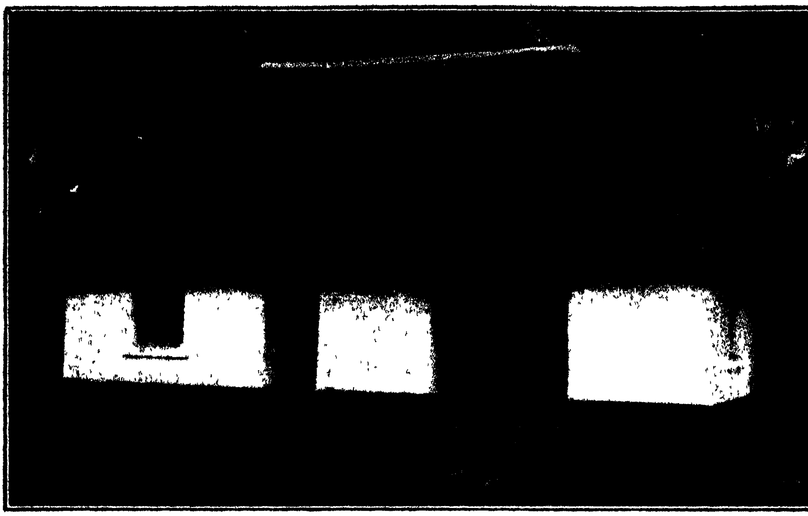
Question No. 4: How should the ramming be done?

Answer: As far as possible the boys should not use their rammers in unison, but alternating.

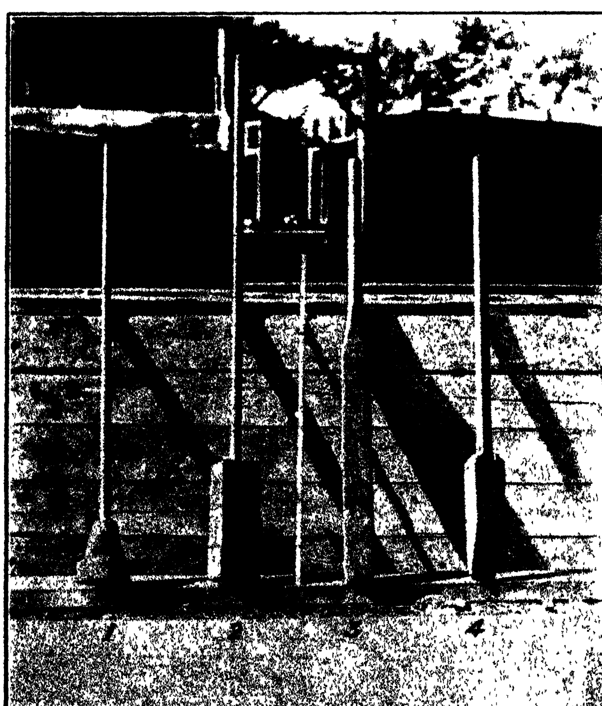
Question No. 5: How can I tell when the earth is properly rammed?

Answer: If one follows the advice of not placing too much material within the moulds (4½ inches) one will very soon learn to know by the sound of the rammers.

* See previous article, April, 1922, *Journal*.



Photograph No. (3).



Photograph No. (4).

Question No. 6: Is the soil used in a wet or semi-dry state?

Answer: The soil is used in as dry a state as possible, and the best gauge is as follows:—When the soil has been thoroughly well sifted, and all stones larger than a pipe-head discarded, also all roots and leaves, then take a handful of the mixed materials and firmly compress same in the hand until the impression of the fingers are well formed; when this is dropped upon the ground the whole should revert to its former state, i.e. loose earth.

Question No. 7: Is it necessary to have a foundation?

Answer: Absolutely necessary, and the foundation should be good and strong too, such as is shown in the diagrams*, otherwise your building will develop nasty cracks, such as are depicted in photograph No. (1).

Question No. 8: How thick do you advise the walls to be?

Answer: 18-inch external and 10-inch internal walls. Nevertheless, many people build their walls 15 inches thick, and all those constructed by Mr. Goldie are 12 inches, as shown in photographs Nos. (4), (5), (6), and (7).

Question No. 9: Can you give me advice as to how I should treat the outside walls, so as to make them water-proof as far as possible?

Answer: Any of the following methods will suit:—

(1) Application of hot linseed oil; one or two coats.

(2) Application of hot coal-tar; first coat applied with the aid of an ordinary garden bucket-pump—all other coats can be put on with the brush.

(3) There are three other practical recipes, all of which have been severely tested by Mr. Goldie and the writer, and there is no doubt in our minds that (*b*) is the best; in fact it is the one universally used:—

(*a*) Pure unslaked lime (one part to two parts water by measure).

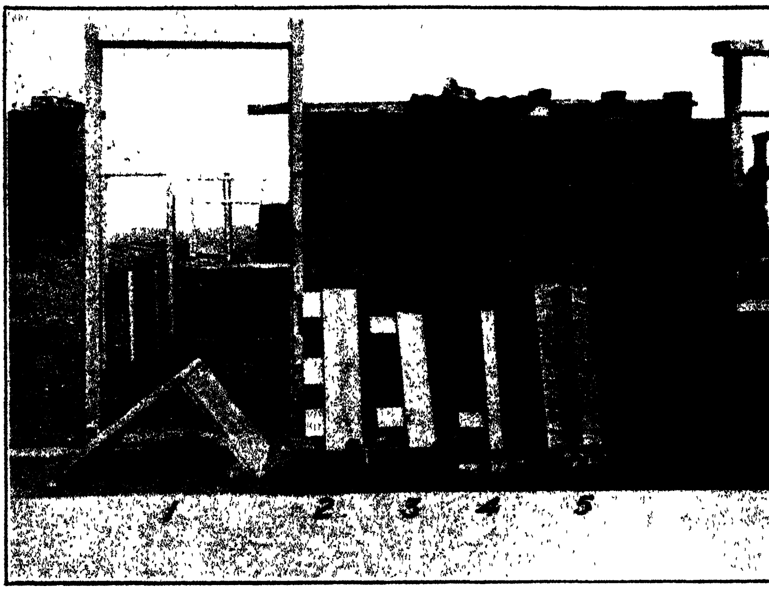
(*b*) Unslaked lime one-third paraffin tin to two-thirds paraffin tin boiling water and ½ lb. tallow (melted), mixed as follows: Boil water first, pouring over lime, gradually stirring up thoroughly meanwhile, and then adding the liquid tallow, stirring occasionally during use.

By the addition of a little washing blue, a truer white would be obtained. The second coat applied two or three days after the first has dried out will give the best results. This is absolutely weather and heat resisting.

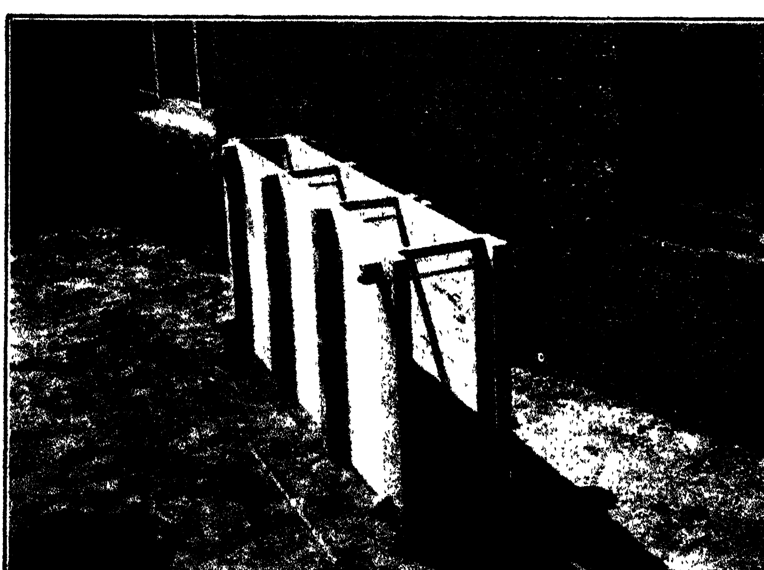
(*c*) Unslaked lime one-third paraffin tin, two-thirds paraffin tin water to ½ lb. common salt.

(4) Two coats Polar Bear Compo will give a rather pleasing effect and are easily applied.

* See previous article, April, 1922, *Journal*.



Photograph No. (5).



Photograph No. (6).

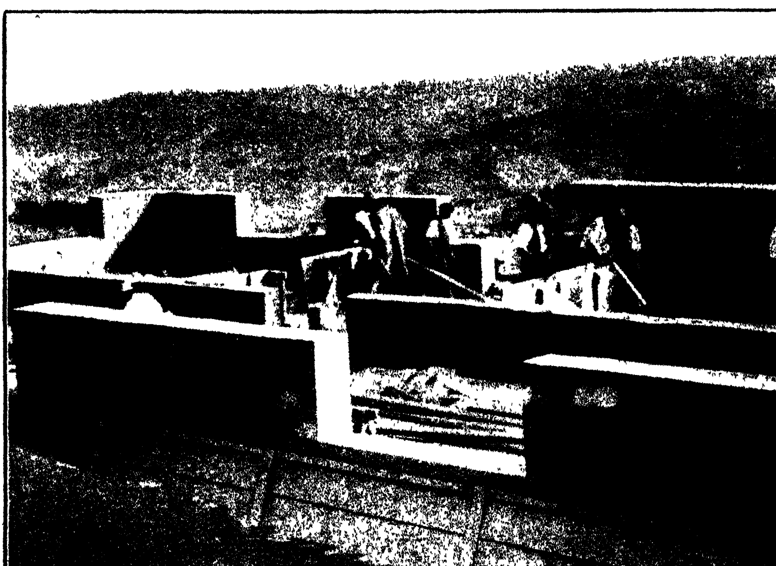
Question No. 10: Can you favour me with a general specification in connection with a pisé-de-terre building?

Answer: Here is a copy of one from the *Spectator*:—

(1) Excavate to a depth of 9 inches over the site, dumping the turf and surface humus where directed—this soil not to be used for building.

(2) Lay a 6-inch bed of cement concrete 3 feet wide under outer walls, centrally on this lay two courses of brickwork in cement to a width of 18 inches, or build up to the same height in concrete.

Lay on this an approved damp-proof course, and on top a further layer of brickwork so as to prevent fracture of damp course when ramming.



Photograph No. (7)

(3) Erect the walls according to the plan on the basis thus formed, carrying them up plumb and true and properly bonded by working round the building, course by course, using the special angle and "T"-pieces at corner and mid-walls so as to keep the work continuous and homogenous.

(4) All stones and flint above the pipe-head size to be removed by riddling; all sticks, leaves, roots, and other vegetable matter to be eliminated.

(5) The soil should be obtained as near the site as possible; very little water, if any, to be used.

(6) The boxes are to be filled in thin layers, not more than 4½ inches at a time and well rammed solid. The workmen are not to use their rammers in unison.

(7) Rammed earth at box-ends to form a key with special break. Stop joints or bevelled down to a 45 degree slope so as to splice well with new span of pisé adjoining. When door and window openings occur, the special stops to be adjusted and firmly secured so as to withstand hard ramming. Two 4 inch by 2 inch by 9 inch plugs to be built into each window-jamb for securing of the frame, and three to each door-jamb.

(8) Insert below floor level where directed a suitable number of 3-inch field draining-pipes to act as ventilators through the thickness of wall The same may be added as roof-ventilators where required. Insert wire-mesh stops to exclude vermin.

(9) Set all frames square and plumb, and where in outer walls flush with finished exterior plaster-face, the joints being covered by a 2-inch by $\frac{3}{4}$-inch fillet.

Where lintels occur, they are to be tailed in at least 9 inches on each side of opening.

Provide plain picture rails round all rooms at window-head level, providing plugs for fixing where necessary. Secure to floor round all boarded rooms a 2-inch by $1\frac{1}{2}$-inch angle fillet as skirting.

(10) The smooth surface of the pisé walling to be hammer-chipped to give good key for plaster. Before rendering or plastering walls, any loose earth or dust to be removed with a stiff brush and the wall surface evenly wetted.

The rendering to be carried evenly round the walls—the minor square angles being roughly chipped down first so as to obviate sharp corners. The main corners of the house are ready-rounded off at 9 inch radius by special corner-moulds.

(11) Bond brick and slab work to pisé walls by driving iron spikes into the latter every few courses at joint level and bedding in.

(12) Colour-wash walls with tallow-lime whiting tinted with ochre. Provide 2 feet skirting of pitch, applied hot, to form base course round exterior of building.

Centrifugal Pumps.

Ordinary reciprocating pumps will throw water at almost any speed of the pump, i.e., whether the plunger makes only a few or many strokes per minute, but not so in the case of a centrifugal pump. The makers of centrifugal pumps invariably stamp on the little brass plate mounted on the pump, the speed in revolutions per minute at which the pump must be run to throw water at its maximum efficiency. If, for instance, it is stated on the pump that it must be run at 1700 r.p.m., it is no use trying to get water with the pump running only, say, 1450 revolutions. The pump can be run at speeds higher than the speed called for without danger, and with a little increase in the output of the pump, but at speeds lower than the required speed the pump will deliver considerably less water than the smaller speed would lead one to expect.

INQUIRIES AND REPLIES.

SELECTED LETTERS FROM FARMERS.

[Hereunder are a number of recent letters replied to by the various Divisions and Schools of Agriculture concerned. They are selected for publication as being of interest to farmers generally in the localities affected. In each case the area only from which the inquiry emanates is given; as the replies must necessarily be curtailed, they will indicate, when required, literature from which further information may be had.]

Egg Eaters.

Ixopo.—My hens eat their eggs; what can I do to prevent it?

Cedara School of Agriculture replies: Make nests in a dark place and have them 10 inches off the floor with tops, so that hens must enter them from the front. As the hens cannot reach the eggs from the floor and cannot well stand up in the nests they will soon be cured of the vice. Filling eggs with mustard, etc., is of little use, and filing the beak is as senseless as it is cruel. If not confirmed egg eaters, a change of run and nests will sometimes have the desired effect.

Pruning Peaches in Bloom.

Maritzburg.—My peaches are coming into blossom. Is it too late to prune them?

Cedara School of Agriculutre replies: Peach trees may be pruned when in blossom, but would be better if it had been performed before reaching this stage. Remove those laterals which bore last season and any which show no blossom buds. Thin out the remainder by one half to provide fruiting shoots for next season.

Cabbage Disease.

Alcockspruit, Natal.—Kindly advise me what to do for my cabbages and cauliflowers, they are rotting off, and I think it must be owing to "aphis," as they are simply covered with it.

Cedara School of Agriculture replies: Spray thoroughly with tobacco extract, one part extract to 80 parts water. Soap should be added at the rate of 1 lb. to 20 gallons of solution. The soap should be chopped up and dissolved in a small quantity of hot water. Since each insect must be actually hit with the spray to be killed, the operation should be thorough. The rotting you refer to is not caused by aphids, but is probably due to "black rot, a disease characterized by discoloration of the veins and dropping of the leaves; eventually the head completely rots. To control it: (1) Treat seed with corrosive sublimate (1 part in 1000 of water); (2) practise crop rotation; (3) watch seed-bed and destroy diseased seedlings.

Moss or Lichen on Fruit Trees.

Donnybrook, Polela.—How can I rid my trees of moss or lichen? The trees make little growth, there being numerous dead twigs and branches.

Cedara School of Agriculture replies: Moss or lichen prevents the bark from performing its function, and, apart from being injurious, forms a nice shelter for insect pests. Spray the trees whilst in a dormant state with concentrated lime-sulphur, using one part of the concentrate to ten parts of water. For citrus, use bordeaux mixture.

Worms in Pigs.

Helpmakaar, Natal.—Kindly give me some advice *re* medicine for worms in pigs. I have twenty-five weaners, ten weeks old; they are fed on skim milk, mealie meal, wheaten bran, sweet potatoes, and green barley. Although they get as much sweet potatoes as they can eat, they do not make satisfactory progress; with a few exceptions they grow more in the belly, so I suspect worms.

Cedara School of Agriculture replies: Try and obtain some santonin. This should be dissolved in warm or hot water and mixed in the slop and fed to the pigs. An ounce of santonin will suffice for fifty to sixty pigs of 100 lb. weight each. Next day give a dose of raw linseed oil to drive out the worms killed by the santonin. Another remedy is a 1 per cent. solution of coal tar creosote given in 1-ounce doses on an empty stomach and repeated in ten days time. Sanitary styes and arrangements are necessary before any treatment will prove of much or lasting benefit.

Starter : Cheesemaking.

Newcastle.—What class of starter is recommended for milk that is distinctly "off" in flavour?

Cedara School of Agriculture replies: Milk that is "off" should be sternly rejected by every cheesemaker who values a reputation. A starter is robbed of its value with milk of this quality, and under such conditions no advantages should be claimed for the starter, although we sometimes hear to the contrary.

Cheese Defects.

Vryheid, Natal.—What are the causes of a weak pasty cheese?

Cedara School of Agriculture replies: Weak pasty cheese follows quick scalding of rich milk, which locks in the moisture. Cut curd finer and scald steadily to a temperature one to two degrees higher than normal in the autumn and cold months. Pasty cheese is often caused by the curd getting cold in the vat or cooler, producing a check on the acid and preventing the escape of moisture. A weak cheese, when paled, gives a swollen plug, which cannot be replaced.

A Pump for Irrigating Lucerne.

Cradock.—I have an opportunity of buying a 3-in. centrifugal pump cheaply. Will this pump throw enough water to irrigate lucerne with?

Grootfontein School of Agriculture replies: You should not buy the pump for the purpose stated, as it will throw you sufficient water to irrigate small beds of vegetables in a garden, but not for irrigating lucerne. For irrigating lucerne lands you should get a 5-in. pump, which will throw about 23,000 gallons per hour. This quantity of water constitutes a good leading stream.

To Prevent Turkeys Flying.

Addo, Cape Province.—Is it possible to cut any small muscle in a turkey's wing to prevent the bird flying, yet leaving its appearance normal? I know it is done with seagulls in Europe, and wondered whether it is also possible with turkeys.

Grootfontein School of Agriculture replies: This procedure would not be suitable, as in all probability it would affect the turkey much more than it does the seagull, as done in Europe. The most satisfactory means is to secure a paddle across the shoulders. The paddle is a light piece of wood about 4 or 5 inches wide, ½ an inch thick, and 18 in. to 20 in. long. Secure this across the shoulders of the bird by tying the paddle by means of tape to each wing, in this way preventing the bird from flying. To prevent the paddle from slipping it would be advisable to bore two small holes over each wing, passing the tapes through.

Weevil in Beans.

Uitenhage.—I have some thirty bags of Natal sugar beans which I wish to hold over till about Christmas. I have the necessary facilities to fumigate against weevil. The temperature is seldom above 70 degrees now, and I believe that fumigation is unsatisfactory if the temperature is not high. Will it be safe to wait till the hot weather arrives? Do the weevils increase rapidly during the winter? The beans are sure to have weevil in a slight degree.

Grootfontein School of Agriculture replies: Beans that are to be stored should be fumigated as soon as possible after harvesting, as some bean weevils, although only slightly present at the time of storage, increase rapidly during the time the beans are stored. Below 60 degrees F. some of the insects may escape destruction. Choose as warm a day as possible for the fumigation. Put the beans in air-tight bins or tanks, and place the carbon-bisulphide in shallow receptacles on top of the beans. The vapour is heavy and sinks to the bottom. Use from 4-8 lb. of carbon-bisulphide for every 1000 cubic feet of space. Be careful not to have a lighted pipe, match, or any other light near-by when using carbon-bisulphide, as this chemical in a gaseous form is highly inflammable and explosive.

Nurse Crop for Lucerne in the Karroo.

Middelburg, Cape.—When should a nurse crop be used in establishing lucerne, and what crop is most suitable for this purpose?

Grootfontein School of Agriculture replies: A nurse crop is useful when lucerne is sown late, that is, in the winter or spring, and also on sandy soil, because it tends to protect the young lucerne plants from the heat of early summer and from hot, drying winds. It tends also to bind or to hold loose soil so that it does not wash during irrigation. Suitable crops are rye and oats, which should be sown thinly, about 30 lb. per acre. The nurse crop should not be allowed to grow to maturity, and should be harvested when still green.

Dodder in Lucerne.

Oudtshoorn.—Kindly inform me as to the best method of eradicating dodder from lucerne.

Grootfontein School of Agriculture replies: The following methods will be found effective: (1) Spraying with a saturated solution of common salt. The dodder is killed, but the lucerne is uninjured. (2) Burning. The lucerne in the infected patches is cut close to the ground. Straw is then piled over the crowns and set on fire.

In both these methods any dodder seed which has been shed will escape and may germinate, causing reinfection again later on. The eradication process will then have to be repeated. It is important to deal with the pest promptly before ripe seeds have a chance of being formed.

Milk Records.

Britstown, Cape.—I have a herd of mixed cattle that give me about twenty gallons of milk per day. It is my wish to improve these cattle by grading up with a pure-bred bull and by keeping milk records to enable me to weed out the worst producers. What I want to know is how to keep milk records.

Grootfontein School of Agriculture replies: A milk record is obtained by keeping count of the amount of milk and butter-fat produced by each cow during her full lactation period, together with a record of the amount of food consumed by each cow. Such are obtained by weighing the milk produced by each cow daily and testing it for its butter-fat content once weekly, while the food fed is easily obtained by weighing the cow's daily ration and multiplying this amount by seven to give the weekly total. If it entails too much work to weigh each cow's milk daily, a record sufficiently accurate for weeding-out purposes can be obtained by weighing the milk once weekly and multiplying this figure by seven to give the week's production. Read Bulletin No. 11, 1913, "The Treatment of Milk and Dairying Stock."

Measuring a Tree.

Achterberg, Cape Province.—Is there an easy method of measuring the height of a tall tree as it stands, and without felling it? The trees that I want to measure are difficult to climb, so that it will be very awkward to measure the height by simply climbing up the tree and measuring the height by letting a tape-line hang down the tree.

Grootfontein School of Agriculture replies: A very easy, and for practical purposes very accurate, method is as follows: Near the tree plant a rod or pole of about 10 feet long vertically in the ground, and measure accurately the height of the pole from the ground surface to the top. Then measure the length of the shadow of the pole and also the length of the shadow of the tree. Multiply the length of the pole by the length of the tree shadow, and divide this product by the length of the pole shadow. This will give you the height of the tree. The best time for measuring will be either in the morning or in the afternoon, when the shadows are longer than the objects which cast the shadows, which will minimize the likelihood of error.

Field Mice and Skunks.

Bayville, Cape Province.—I am troubled with field mice and skunks in my lucerne lands and sluit walls. Please advise as to the best means for their destruction.

Grootfontein School of Agriculture replies: For the destruction of field mice the following baits can be employed: (*a*) Ground white arsenic, 1 lb.; cheese, 1 lb.; glycerine, 1½ oz.; water, 3 pints; flour, 2½ lb.; aniseed, ½ lb. Enough black aniline to give a grey colour. Melt the cheese with glycerine in a third of the water; add the flour and the rest of the water. Keep on boiling till the flour is well boiled. Stir in arsenic, aniline, and aniseed. Put pieces as large as a hazelnut in the passages.

(*b*) A bait containing barium carbonate is made as follows: Barium carbonate, 6 oz.; flour, 16 oz.; dripping, 4 oz.; salt, ½ oz. Use pieces as large as a hazelnut.

Care should be taken that children or farm animals do not pick up these baits, as poisoning is sure to follow.

For skunks I would advise putting strychnine in meat and placing it near the burrows.

Read Bulletin No. 4, 1921, "The Destruction of Rodents," obtainable from the Department; price, 3d., prepaid.

Basic Slag or Superphosphate.

Standerton.—How much basic slag do you recommend me to use per acre for maize?

Potchefstroom School of Agriculture replies: 150-250 lb. is quite sufficient; but why buy basic slag when you can get a better and a cheaper phosphate in superphosphate? If you are afraid of a sour soil, lime costs only 20s. a ton, and this and super applied separately will give you better returns for less money.

Nitrates *versus* Legumes.

Swaziland.—I think my soil needs fertilizing, and I was contemplating buying some nitrates. How would you recommend me to use these?

Potchefstroom School of Agriculture replies: Nitrates alone applied on your soils will rarely be profitable. They will help to stimulate leaf growth on a forage crop, but will not benefit grain production. You can also get increased leaf growth more cheaply by planting your barley or oats on a land that has just carried some legumes. The greatest need of our soils is phosphates, and if you want to buy and try something, buy superphosphate. This will give you far more satisfaction than nitrates. Until the phosphate content of your soil is improved you can expect little benefit from nitrates.

Die-Back in Roses.

Aliwal North.—I am enclosing two specimens of branches of my rose trees, and should be glad to know (1) what is the matter with them; (2) how to control the disease, if any; (3) whether other trees, e.g. vines, are likely to become infected.

The Division of Botany replies: The specimens of rose twigs submitted are infected with a fungus disease probably due to the organism *Coniothyrium fuckelii.* The disease is spread by means of the fungus spores which are blown about and infect the plant through wounds, resulting in a "die-back" of the part affected. Control measures consist in cutting away and burning all diseased and discoloured wood, painting over cut surfaces, and spraying all plants with some good fungicide, such as bordeaux mixture or lime-sulphur. Care should also be taken to use only cuttings from healthy plants. Infection might be carried by using an apparently healthy cutting from a diseased plant. The disease appears to attack all kinds of roses, but is not known to occur on other plants.

Wild Cotton.

Bloemhof.—I enclose a sample of wild cotton that was gathered from the pod of a plant known as "melkbos." The plant is very common in these parts, and I should be glad to know whether the cotton has any value.

The Division of Botany replies: The "wild cotton" consists of the seed-hairs of the plant known botanically as *Asclepias fruticosa.* This plant is a member of a large family of plants, all of which are characterized by having long silky hairs attached, parachute fashion, to the tips of the seeds, and the greater number by having milky juice. The "cotton" or floss from these plants was submitted to the Imperial Institute for investigation as to its economic and commercial value. The report received was not at all favourable. The floss is useless for weaving purposes, and for the filling of pillows, etc., it cannot compete either for resiliency or for cheapness of production with other vegetable downs, such as kapok, already on the market.

Green Manure.

Harrismith, Orange Free State.—What is the best crop for green manure?

Glen School of Agriculture replies: The best crop for green manure depends on the method of green manuring adopted. If the crop is to be eaten off by stock or made into hay, the suitability of the crop chosen for these purposes should be mainly considered, a mixture of a legume, such as cowpeas, with Sudan grass or maize preferably, being used. If, however, the whole crop is to be ploughed in, the bulk of green material produced is the main consideration.

For the reason that legumes, provided they form nodules, add nitrogen to the soil, it is usually recommended that a legume be used for green manuring purposes. Our soils, however, usually do not respond profitably to nitrogenous manuring, and the addition of nitrogen to the soil by the green-manue crop is probably not so important as the addition of humus. Very few experiments on green manuring have been carried out in South Africa, but in countries where the crops *do* respond to nitrogen, leguminous crops, when used as green manure, have given as good a return in the following crop as rape and mustard and other crops.

Feeding Value of Cotton-seed Cake.

Bethlehem, Orange Free State.—Please give me some information about cotton seed for feeding to dairy cows?

Glen School of Agriculture replies: Cotton seed is usually obtained in the form of cake or meal for feeding purposes. Cotton-seed cake contains the following percentages of digestible nutrients: Crude protein, 21.1; carbohydrate, 33.2; fat, 7.4 It is a valuable nitrogenous concentrate for dairy cows. Though it is not very palatable, cattle soon take to it. It is best to mix it with the other feeds given. The amount to feed is from 2-3 pounds daily. It has a costive tendency, and should therefore be fed along with laxative feeds, such as bran, silage, and roots. It should not be fed to cows shortly before calving.

Purity of Vegetable Seeds.

Kimberley.—Why cannot vegetable seeds—especially cabbage and cauliflower—purchased from the same seedsmen year after year be relied on.

Glen School of Agriculture replies: The fault lies in bad selection of plants for seed production, or more probably to no selection at all. Cabbages and cauliflowers are liable to cross-pollinate, and if several varieties are grown near each other the result will be that the seed will be impure. The seedsmen should practise severe roguing, and the farmers should obtain their seeds from reliable growers, and cease to send their orders to seedsmen on whose seed they cannot rely.

Earthen Dam Wall.

Bloemfontein.—What is the best method to compact a dam wall thoroughly?

Glen School of Agriculture replies: Select the best soil which can be procured near the site of the dam wall, if possible a mixed clay and sand soil which will not require material of another type added to it to make it efficient, labour and expense thereby being reduced. Use wet soil, if possible, and place it on the wall in concave layers about six inches thick, thoroughly wetting the top of the layer and puddling well.

A good method to puddle or compact the layer is to drive animals over it, say a flock of sheep, the feet of the animals puddling the earth in a very efficient manner. Repeat this operation with every layer of earth added.

Plant the top and slopes of the wall with grass, the roots of which bind the soil together, thus preventing channels being washed in the wall by the rain.

Scaly Leg.

Bloemfontein.—How can I cure scaly leg in fowls?

Glen School of Agriculture replies: Many oils and ointments have been advocated for scaly leg in fowls. As the result of careful experiments in Germany, Haiduk recommends oil of caraway, because of its penetrating power, and because it is less irritating than some of the treatments usually advised. It is best applied as an ointment consisting of: Oil of caraway, 1 part; vaseline or lard, 5 parts. When there is no need to hasten, this ointment is applied to the diseased parts every few days until a cure is effected. If a quick cure is necessary, the scales and crusts are first removed by soaking the feet and legs in warm soapy water for a few minutes, and then brushing them with a stiff toothbrush or other small brush; care must be exercised not to cause too much irritation and bleeding. When the diseased surface is dry, the ointment is rubbed in thoroughly; repeat about twice a week till cured.

Weights of Pure-bred Berkshires and Large Blacks.

Darling, Cape Province.—What are the minimum weights at each monthly stage of pure-bred Berkshires and pure-bred Large Blacks? I want to be able to decide whether or not my pigs are up to standard in so far as size for age is concerned.

Elsenburg School of Agriculture replies: The following are minimum weights of pure-bred Berkshires and pure-bred Large Blacks respectively:—At 1 month of age, 12 lb. and 15 lb.; at 2 months, 25 lb. and 30 lb.; at 3 months, 38 lb. and 45 lb.; at 4 months, 50 lb. and 60 lb.; at 5 months, 68 lb. and 75 lb.; at 6 months, 82 lb. and 95 lb.; at 7 months, 100 lb. and 115 lb.; at 8 months, 122 lb. and 140 lb.; at 9 months, 145 lb. and 165 lb.; at 10 months, 168 lb. and 190 lb.; at 11 months, 190 lb. and 220 lb.; at 12 months, 220 lb. and 250 lb.

Fertilizers for Potatoes.

Cape Flats.—Is Government guano a suitable fertilizer for potatoes and vegetables?

Elsenburg School of Agriculture replies: To use Government guano for potatoes and vegetables to the best advantage, it should be mixed with superphosphate and with some sulphate of potash. About 300 lb. Government guano, 300 lb. superphosphate, and 80-100 lb. sulphate of potash would be a suitable mixture to be used on your soil at the rate of 400 to 450 lb. per acre.

Clovers for the Western Province.

Stellenbosch, Cape Province.—What clovers would you recommend for the Western Province?

Elsenburg School of Agriculture replies: One or two of the indigenous "clovers" are well worth consideration. The common "burr clover" (*Medicago denticulata*) provides an excellent feed for a considerable length of time. The objectionable feature—the burr—is more than counterbalanced by the good qualities of this plant, which readily establishes itself if sown in the autumn.

As regards true clovers, broad red clover, cow grass, late flowering red, and Chilian clover provide a good cut. These four are very closely allied varieties, and at Elsenburg the first-mentioned—broad red—has given the best results. If irrigation can be practised, these clovers should give excellent returns during the summer months. For pasture work, wild white clover, though somewhat expensive, has given good results under adverse conditions during the past three seasons. It is apparently a selection of the ordinary Dutch or dwarf white clover, and is more hardy than the Dutch clover, which, however, is well worthy of consideration. Another hardy legume which does well here in poor soil is Birdsfoot Trefoil. The plant is deep-rooting, and has shown itself to be very robust.

Oat and Vetch Silage.

Moorreesburg, Cape Province.—Would you recommend the growing of oats and vetches for silage purposes? What variety of oats and what variety of vetches? How much seed of each per acre?

Elsenburg School of Agriculture replies: Spring vetches and oats mixed do well practically all over the Western Province. The crop is produced more cheaply than either sorghums, millets, or mealies, and from a silage point of view it is equal in value to mealies. The return per acre of green material varies from 3 to 4 tons. The growing of oats and vetches mixed either for silage or hay cannot be too strongly recommended to Western Province farmers. Sow the mixture of English spring vetches and Algerian oats in early May at the rate of 20 lb. vetches and 40 lb. oats per acre. Algerian oats mature later than the vetch, but it is recommended in preference to early varieties, owing to the firmness of straw, which is better able to carry the vetch vines and prevent lodging of the crop so easily.

Citrus Fruit Rot.

Cape.—I should be obliged if you could pay a visit to my orchard for the purpose of advising me about a disease affecting my citrus trees.

Elsenburg School of Agriculture replies: Concerning the recent visit to your citrus groves, the disease present is that known as the "citrus fruit rot," and is one which is fairly common in the orchards at this time of the year. Oranges, naartjes, lemons, and limes all suffer. At first the fruit shows watery patches on the skin. Soon these patches become covered with a white mould, which later on assumes a bluish or greenish tinge. The whole fruit becomes covered with the mould, and the fruit drops to the ground. The disease is recognized as a wound parasite. The skin of the fruit may have slight abrasions due to such causes as scratching by twigs, carelessness in picking, fowls, and game interfering with the lower branches, puncturing insects. To minimize losses, attention should be paid to the remedying of causes where possible. Fallen fruit should be collected regularly and buried deeply. Great care should be taken to keep the grove in as clean a condition as possible. If the windbreaks are too dense they should be opened up to admit of a freer circulation of air throughout the orchards.

Evading the Regulations.

Rustenburg.—Will you kindly state how it is possible for undergrade oranges to get to England, although subject to inspection?

The Chief, Division of Horticulture, replies: So long as a certain class of grower aims at defeating the regulations, so long will a certain amount of inferior stuff find its way overseas. In inspection it is not a matter of opening boxes at bottom or top. In the boxes opened the whole of the fruit is taken out, inspected, rewrapped, and repacked. If this is not done there would be no check on the counts. A shipper sending 500 or 1000 boxes, perhaps plucked from half a dozen orchards, stands a chance of getting some rubbish overseas and he takes it. Of 500 boxes, 25 would be examined, and, if doubtful, another 5 or 10 to make sure. In a parcel of 500 boxes, except every one is inspected, and that would be an impracticable proposition, there is always the risk, if not put up by an honest packer, of some bad stuff getting through.

It is a remarkably strange state of affairs when the individual can be so ignorant that he cannot realize that it is in his best interests to pack only good fruit.

The *Journal* aims at keeping farmers informed of what the Department of Agriculture is doing, also of such matters affecting their interests as come under its purview. The *Journal* contains original articles for the guidance of the farmer on the many and diverse problems which face him. Every farmer should read it and keep it.

THE POULTRY YARD MONTH BY MONTH.

September.

By J. J. JORDAAN, Lecturer and Instructor in Poultry, School of Agriculture, Glen, Orange Free State

Chickens.—Chickens must be watched closely and kept comfortable and warm at night; take care that they do not sleep in cold or damp quarters or roup is sure to result. Weariness must not be allowed to overcome one in giving them their regular and constant feeding. Continue separating cockerels and pullets and also culling. In culling, go over those again that appeared "good enough" last month. The number of brooders no doubt will want increasing with the growth of the chicks. Two lots of 25 chicks will always do better than one lot of 50. Examine the small chicks frequently on the head, throat, and fluff, under wings, and tail for insects; these are most troublesome from this month onwards. If present, rub on some ordinary fat. As the willow trees are now in leaf, the leaves may be given to the chicks as green food; they should be finely chopped before being fed

Showing.—Birds intended for exhibition should be rung at once if this has not already been done. The most likely looking birds should be separated and given special attention; it is from now on that the winner is made, and not during the two weeks before the show. As a rough outline of immediate attention required—

heavy breeds will want bone-forming foods,

tight-feathered breeds need hard grain and pea and bean meal in the mash, which is best given dry;

loose-feathered and fluffy birds want plenty of slightly moist mash, with a small quantity of sulphur, linseed meal, and ground sunflower added.

Incubation.—This is the last of the good months for incubation, so if the number of chicks hatched is not the number desired, set all eggs possible that pass the test as good enough for incubation.

General.—Great and sudden changes may now be expected in both weather and temperature, therefore be on the alert and prepared for such changes.

Adult birds will be inclined to lay on fat, keep them down in condition with a fortnightly dose of epsom salts in their drinking water, just to taste, and by digging the grain into the ground. Fresh drinking water should be given twice a day and kept shaded. From now on to March, dip all fowls monthly for insects, and spray all nests, houses, and brooders with one of the commercial carbolic dips. Insects must be fought; an ovinaphthal egg kept in the nest, or a little of the following powder sprinkled in the nest fortnightly, will do much in this direction.—1 part naphthaline (flaked), 20 parts sulphur.

NOTE FROM THE CEDRA SCHOOL OF AGRICULTURE.

Pullets for Autumn Laying.—In Natal pullets required for autumn laying should now be hatched; this refers more particularly to light or non-setting breeds, such as Utility Leghorns, Anconas, etc. If hatched earlier they will go into moult with the adult stock in January and February. For this class of stock the dry mash system of feeding is strongly recommended, and it will be found that practically no cases of diarrhoea occur when moistened meals or "wet mash" is withheld.

The following feeding menu is a good one:—

CHICKS TO THREE WEEKS OLD.

Dry Mash.			*Grain Mixture (in sand).*		
1	part by measure	coarse oatmeal.	1	part by measure	crushed kaffir corn.
2	,, ,,	wheaten bran.	1	,, ,,	finely crushed maize.
1	,, ,,	mealie meal.	1	,, ,,	crushed wheat.
½	,, ,,	Crayferine.	1	,, ,,	coarse oatmeal.
			1	,, ,,	Inyati.

The above mash should be fed in a hopper so constructed that no waste will occur, and should be open from say 7 a.m. to 10 a.m., then shut until 1 p.m., and open again until 3 p.m. At 11 a.m. a feed of the above grain mixture should be given, and again at 4 p.m.: it is essential that the last feed be of grain. No food of any description is necessary until the chicks are 24 to 36 hours old. Water may be supplied with the first feed, and should always be available afterwards.

Plant Nurseries in Quarantine as at 1st August, 1922.

Name.	Address.	Cause of Quarantine.	Extent of Quarantine.
A. E. Todd	Pietermaritzburg	Red Scale ...	All citrus.
J. S. Rossouw... ...	Wellington ..	Red Scale ...	All citrus.
C. F. Marais	Wellington ...	Red Scale ...	All citrus
Badcock & Cunningham	Uitenhage ...	Red Scale ...	Whole Nursery (all citrus).
F. P. Long	Clumber	Red Scale ...	Whole Nursery (all citrus).
S. B. Bartlett	Clumber	Red Scale ..	Whole Nursery (citrus).
F. N. Tarr	Bathurst	Red Scale ...	All citrus.
D. A. English & Co ...	Pietermaritzburg	Red Scale ...	Lemon stocks.
R. Mason & Son ...	Pietermaritzburg	Red Scale .	Lemon stocks.
T. F. Elphick	Malelane... ...	Red Scale ...	Part Nursery (citrus).
Municipal Nursery ..	Potchefstroom ...	Ross Scale ...	Part Nursery (all privets).

CITRUS CANKER ERADICATION.

INSPECTION WORK JULY, 1922

Farms Inspected -

Rustenburg District (Hex River Ward).—Buffelspoort No. 668, Spruitfontein No. 349, Groen Kloof No. 418, Rhenosterfontein No. 546, Buffelshoek No. 900, Rietfontein No. 431, Roodekopjes No. 171, Bokfontein No. 647, Waterval No. 541, Elands Drift No. 248.

Pretoria District (Crocodile River Ward).—De Kroon No 420, Zandspruit No. 379.

Waterberg District (Nylstroom Ward).—Roodepoort No. 2148.

Fresh Infection—Nil.

Fresh Outbreaks—Nil.

Total Number Inspected—

Nursery trees, 22,534; trees other than nursery, 12,647; trees found infected, nil.

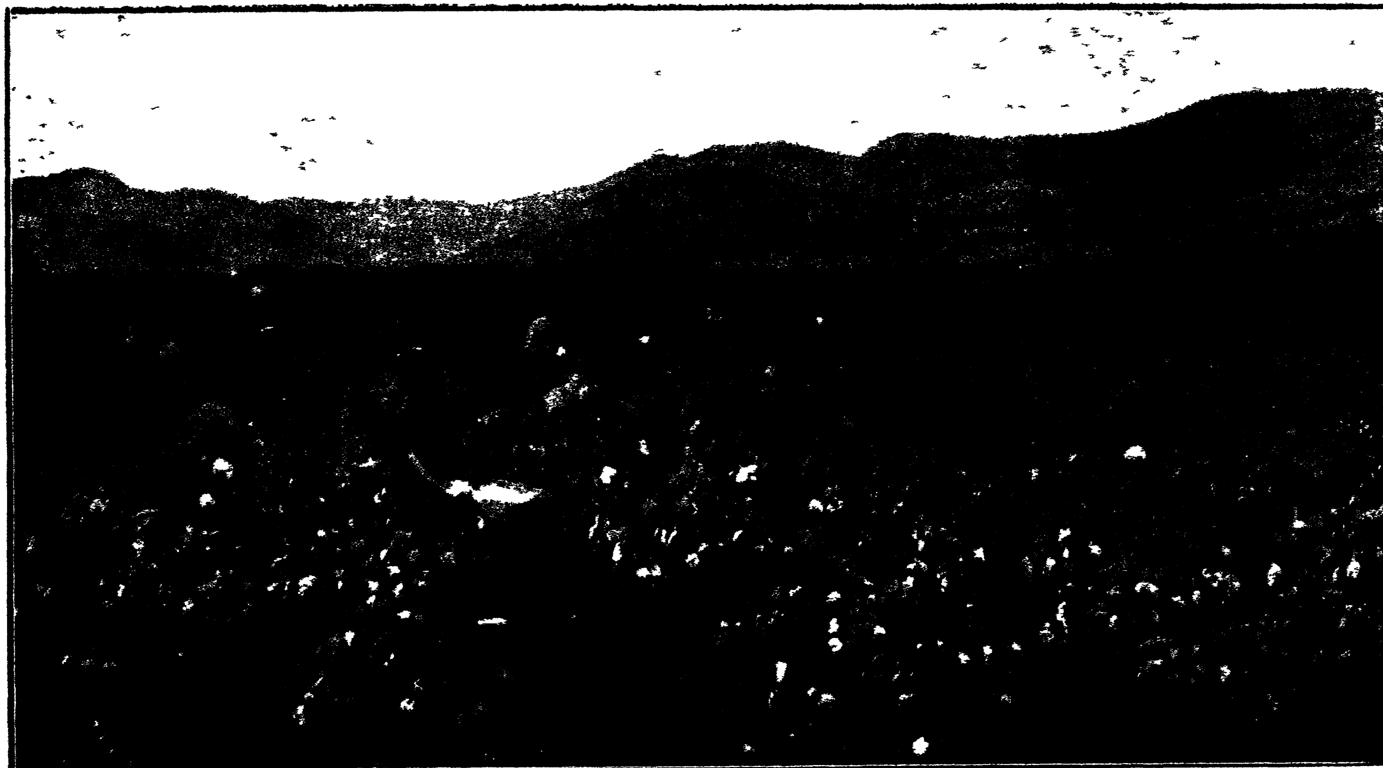
Number of inspectors engaged, 21.

NOTES FROM THE "GAZETTE."

Attention is drawn to the following matters of interest which appeared in the *Union Government Gazette*:—

(Abbreviations: "Proc."—Proclamation; "G.N."—Government Notice.)

Gazette. *No.*	*Date.*	*Item.*
1250	14/7/22	Contributions towards the cost of dividing fences in the Groot Marico Ward, Marico District, have been declared obligatory. (Proc. No. 103.)
1250 1254 1257	14/7/22 21/7/22 28/7/22	The compulsory dipping of cattle and the other treatments for disinfection as required by the Stock Disease Regulations have been ordered as follows: (*a*) every five days in the five-day dip for portions of Piet Retief, Mount Frere, Helpmakaar, Ladysmith, Umvoti, Mpofana, Estcourt, Barberton, Richmond; (*b*) every seven days in the seven-day dip for portions of Lydenburg (G.N. Nos. 1095, 1100, 1128, 1183.)
1250 1254	14/7/22 21/7/22	The following are the notifications of brands registered in the various Provinces for the quarter ended 31st March, 1922:— Cape Province, G.N. No 1105, Transvaal, quarter ended 30th June, 1922, G.N. No. 1140; Cape Province, G.N. No. 1214, Orange Free State, G.N No. 1215.
1250 1257	14/7/22 28/7/22	On account of the prevalence of anthrax in certain areas of the District of Hlatikulu, Swaziland, a portion of the district has been declared an infected area. (H. Com. Notice No. 59, *Official Gazette* No. 1092.) Various other areas in Swaziland have been declared infected areas on account of the prevalence of East Coast Fever (H. Com. Notice No. 1094, *Official Gazette* No. 1094.)
1052	19/7/22	In the *Gazette Extraordinary* of this date appears the Co-operative Societies Act No. 28 of 1922, providing for the formation, registration, and management of Co-operative Societies with limited liability, Co-operative Agricultural Societies with unlimited liability, and Co-operative Trading Societies with limited liability. (G.N. No 1123.)
1254	21/7/22	The advances made by the Government in respect of the erection of certain dividing fences in the Division of King Williamstown are together with interest, recoverable from each adult male inhabitant of the location concerned during the year 1923, in the form of a levy, payable on the 1st January, 1923 (Proc No 110)
1260	4/8/22	Similarly in respect of certain dividing fences in the Sub district of Indwe (Proc No 114.)
1257	28/7/22	The provisions of the Grass Burning Act are applicable in the Magisterial Division of Mtunzini as from the 18th July, 1922. (Proc. 112)
		The prospectus of the School of Foresters and Forest Apprentices at Tokai is published, and applications for admission to the school, which must reach the Chief Conservator of Forests, Pretoria, not later than 30th September, are invited. (G.N. Nos. 578 and 579.)
		All cattle within the Piet Retief District are required to be distinctly branded with the owners' registered brands within the 90-day period ending 25th October, 1922. (G.N. No. 1182.)
		New regulations in respect of the export of eggs oversea are in operation as from 1st August, 1922, and take the place of those previously published in 1917. (G.N. No. 1202.)
1260	4/8/22	All sheep entering the Potchefstroom District, with the exception of those coming from adjoining protected and semi-protected areas, will be subject to the permit and dipping provisions contained in the Scab Regulations dealing with protected areas. (G.N. No. 1232.)



COTTON PICKING IN THE EASTERN TRANSVAAL.

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NOTES.

Sheep Breeding for Export.

Following articles on the subject written by him and published in the *Journal* (August, 1920, and December, 1920), Mr. Rivers,* the officer in charge of the sheep at the Potchefstroom School of Agriculture, has contributed another, published elsewhere in this issue, which gives further results of experimental crossing at Potchefstroom, with the object of producing lamb and mutton for the market. The article is of a very informative nature, and traces the rise of the export trade in frozen meat of Australia and New Zealand, which though subject to reverses and difficulties eventually established itself. Apart from the very practical information the article contains in regard to the cross-breeding of sheep, its sound advice and review of our position to-day should stimulate every farmer. Reference is made to the natural advantages of South Africa, the surplus of live stock and the low market, and the consequent need for improving our sheep breeds so as to secure a share of the world's markets. To this end the introduction of cross-breeding on the right lines, and a better system of management and marketing are recommended; and for this purpose our five million Persians, bastards, and nondescript sheep should be utilized, leaving the other breeds of sheep to supply the better classes of wool. "If we do not improve our methods, the result will be a continued decline in prices until it will no longer be profitable to raise sheep. This is rapidly coming about, and the only way to stop it is to breed sheep suitable for the export trade." This is the finding of an officer who has keenly studied local and outside conditions, nor can any one doubt that along the lines advocated lies the way to the stabilization of the local market and the expansion of the sheep industry.

* With deep regret we have to add the news of the death of Mr. Rivers at Potchefstroom.

The Wire-worm of Sheep.

While the greater portion of the Karroo is generally free of the wire-worm of sheep, there are large areas of grass country in the Union in which sheep farming is practised where the worm is prevalent. From this cause losses both direct and indirect are incurred, in the latter case owing to the low condition of the sheep, induced by the presence of worms, leaving it an easy victim to drought or any other untoward happening. Lambs and young sheep are most prone to affection, but it is the adult sheep which, seemingly healthy, harbour the worms for a long time and in their droppings scatter eggs to infect the veld, and thereafter the rest of the flock, that are a serious source of danger. Fortunately, a remedy exists for the evil, and how it is to be applied is told in a review, published in this issue of the *Journal*, by the Division of Veterinary Education and Research, on the life-history of the wire-worm. There are six stages in the development of the wire-worm, and in order to deal with it effectually farmers should be acquainted with the life-cycle of the worm. In tick eradication, stock collect the ticks, are dipped regularly, and the ticks thus destroyed, and after a year or two of dipping the farm becomes clean—with wire-worm, the sheep collect the larvae which are destroyed by dosing: if systematically carried out dosing will rapidly reduce the wire-worms to negligible numbers. An infected pasture may remain infected for at least a year, and all sheep on it during this time are liable to infection; moveover, a living sheep spreads the infection so long as adult wire-worms are present in the stomach. In order to suppress the pest therefore, the wire-worms must be killed in the stomach of the sheep by using the wire-worm remedy supplied by the Division of Veterinary Education and Research, and by the systematic application of the remedy, as explained in the review referred to, the farm will eventually be cleared of mature larvae which would otherwise enter the stomach of the sheep, the source of infection on the veld thus disappearing.

Advertising the Union's Products.

Thousands of visitors thronged the Royal Agricultural Show at Cambridge, England, last July, and great interest was displayed in the exhibit there of South African produce arranged by the Trade Commissioner. Many inquiries were made regarding the various articles, and numerous questions relating to farming, etc., in South Africa were dealt with. The articles on view covered a wide field and furnished an excellent advertisement of the riches of the Union. In reporting on the show, Mr. Canham, the Trade Commissioner, states that experience has demonstrated the most useful advertising medium of these displays, which invariably result in many inquiries as to where supplies are obtainable. On the present occasion it was arranged with one of the largest produce firms in Cambridge to stock supplies of South African jam, canned fruit, oranges, grape fruit, naartjes, butter, cheese, and bacon during the period of the show with satisfactory results. The Press very favourably commented on the exhibit, and altogether this year's Royal Show helped to widen oversea appreciation of South African produce.

The Export of South African Produce: An Essential.

Farmers are alive to the need of finding markets oversea for their products and in viewing the position there is one thing that should be foremost in their minds, and that is the importance of striving to improve the standard of their product, both in quality and appearance. It is a matter that is constantly referred to in this *Journal*, and is invariably impressed by the Union's Trade Commissioner in London. In a recent report from this officer on the export trade in fruit, it is pointed out that while the citrus consignments received thus far this season show considerable improvement, the packs of many growers are still far from what they should be. In a shipment from South Africa that had just come on the market, several new packs were noticed that gave evidence of much care in packing and selection, but there were others from growers who persist in using shabby and dirty looking cases. Although the fruit in the latter was good, the general appearance of the pack was poor which, as a consequence, was at a distinct disadvantage when stacked alongside a smart, clean, and attractively prepared pack. A clean box, indeed, helps in no small measure to a quick sale. For instance, an experimental shipment sent over by the Department sold readily at 22s. to 24s. for seedlings, and up to 25s. for a few navels: the parcel had been very attractively packed and served to illustrate the fact that South African shippers need not fear competition provided always that they maintain a high standard of quality and pack attractively. Oranges from Australia are being placed on the market in very good condition, well graded and packed, presenting a nice bright colour with clear skins. Our own type of box has been adopted by the Australian packer and the package has a very smart appearance. Competition, therefore, must now be expected from this quarter. It must be expected also from Brazil: oranges are now coming forward from that country, and the style of packing, it is observed, is being progressively improved upon. Whether it be oranges, however, or any other form of product, the essentiality of quality and packing must now be evident to every producer. He is catering for a consumer that has the world's best to choose from: a consumer, moreover, who has his own idiosyncrasies and tastes. Producers in other countries are studying the needs of this consumer, and unless the producer of South Africa does likewise he cannot successfully compete. Fortunately, this country is able to produce many articles of high standard, and with the advice that the Department is able to impart to the farmer as to the manner of growing and preparing these for market, there is every reason to expect that in such products we shall become and continue preeminent.

Mushroom Growing.

The Department receives many inquiries regarding the raising of mushrooms, and Miss Bottomley, of the Division of Botany, contributes to this number of the *Journal* an article giving full particulars. The mushroom, it is pointed out, is, contrary to what many people think, an easy crop to grow, and beginners are often as successful as those who have had much experience. Little space is needed for cultivation, and there is no reason why greater attention should not be given to growing this useful and delicious vegetable.

Hoven in Cattle: A Greatly Improved Stomach-tube.

Cattle-farmers, particularly those having pedigree stock, will be interested in an article published in this issue of the *Journal* on the subject of Acute Tympanites, or Hoven, in cattle. It is written by Dr. Viljoen, of the Division of Veterinary Education and Research, and describes the ailment (which is defined as an abnormal accumulation of gases in the large stomach), the causes, symptoms, and treatment being clearly explained. There are both preventive and curative treatments, and it is in respect of the latter that Dr. Viljoen draws attention to a greatly improved stomach-tube that has recently been produced by Dr. Nuesch, of Switzerland. The instrument itself is described and how it is used, and it is advised that it should be kept on the farm, for it may be found of considerable value and be the means of saving the lives of animals. Cases of acute tympanites usually develop very suddenly, and, unless immediate relief is afforded, suffocation sets in, and death generally takes place in two or three hours, sometimes sooner. Where the stomach-tube is not available the rumen (the first stomach) must be punctured to permit the accumulated gas to escape; it is an operation accompanied by danger, however, and it is advisable that every stock-owner should be provided with the proper instrument. Further particulars regarding Dr. Nuesch's invention and where it is obtainable may be had on application to the Director of Veterinary Education and Research, Onderstepoort, Transvaal.*

The Control of Red Scale in Pears.

Designed for the purpose of making it possible for the fruit-grower to lessen considerably the cost of producing a crop of first-class pears, spray experiments for the control of red scale in pear orchards have been carried out at Elsenburg by Dr. Pettey, and are still in progress, and the results up to the present are given in an article published in this issue of the *Journal*. In recent numbers of the *Journal* valuable advice on a subject of much concern to fruit-growers has been contributed by Dr. Pettey, and the present article (a considerable portion of which has already been published by the Western Province Agricultural Society in its journal) gives added information that will further assist them in contending with orchard pests such as red scale, fusicladium, and codling-moth, as well as the fungous diseases. The rigorous control of the insect pests and fungous diseases that invade the orchard is one of the most difficult and the most important phases in the farm economy of the fruit-grower, and the investigations being carried on by Dr. Pettey, and also by Mr. Putterill, of the Division of Botany, are of particular value to an industry that has already established a reputation on the oversea fruit-market which raises high the name of South African produce. In the form principally of articles and notes in the *Journal* these two officers have contributed valuable additions to the literature on a subject that every fruit-grower, whether for the local or oversea market, would do well to study, for his success depends largely upon the proper spraying of his trees and at the right time.

* See also advertisement in this month's issue.

Winter Vacation Short Courses, 1922.

The winter vacation short courses of instruction were held as usual this year at the schools of agriculture, including Cedara, where, owing to the training of returned soldiers, these courses have not been possible since 1918. Their popularity is evidenced not only by the increasing attendance from year to year, but also by the individual interest and keenness of those attending. The attendance figures for the last nine years (commencing from 1914) are as follows: 106, 193, 265, 300, 349, 398, 378, 419, and 641. Of the total of 641 students for 1922, 397 were men and 244 women (38 per cent.); the majority, 446, were of the farming community, 73 were teachers and 122 had other occupations.

Potchefstroom is the only institution which showed a decrease in the proportion of farming representatives, ascribed, happily, to the increasing facilities for extra-mural instruction offered to the farming community of the Transvaal in the way of "farmers' weeks" and other organizations of a like nature, where lectures and demonstrations are given. At the other schools there was a large increase in the proportion of farmer students—a very encouraging feature, indicating a growing desire on the part of the farming community to improve their methods.

These short courses are held during the winter vacations, as accommodation is then available owing to the absence of the regular students, and farmers are not too busy at that time and can spare a week or so to attend. For teachers at public schools specially designed courses are arranged (when possible) to take place during the ordinary school holidays; unfortunately, in the case of Glen, the poultry course could not be held this year during the school holidays, and no teachers could attend it, although many desired to do so.

Formerly the short courses consisted of two periods of about two weeks each, the first period being devoted to subjects suitable to small-holders, teachers, and women, while the second was designed more for farmers. The tendency during the last few years, however, has been to introduce "single subject" courses or, at most, two or three closely allied subjects, and at the same time to reduce the period of each course to a week at the longest. It was felt that in the limited period of a fortnight it was impossible to teach a large number of subjects, and that the aim should rather be to concentrate on one subject so as to give students the applied technical knowledge they were specially in search of. Many students who attended the longer general courses were keen only on one or two subjects, yet had to take all the other subjects and thus remain longer than necessary away from their work, while the subjects on which they were seeking information could not be treated as fully as desired. It was also found that often the students attracted by the general courses were not the most desirable type: their ostensible desire to take a large number of subjects, evinced no particular keenness to learn any of them very thoroughly. A few of the two weeks' general courses were held this year at certain of the schools, but experience again showed that they are not altogether suited to the requirements of the farming community. It is, therefore, proposed next year to continue the process of specialization, thereby obviating the difficulty of many farmers in arranging for absences from their farms for more than a week at a time.

That the change towards greater specialization in the courses has been entirely beneficial is shown by the number and type of applicants for them. The Principal of Glen remarks, *inter alia*: "The lecturers are unanimous that it has never before been their pleasure to teach "short course" students so keen as on the present occasion: not a single student missed a lecture, and some of the students attending the first course so appreciated it that they stayed for the following courses. At the termination of each course middle-aged and prosperous men and women students specially acknowledged the benefit gained, the excellence of the instruction, and the earnestness and ability of their instructors, and have further stated that they will henceforth be advertising agents for the institution."

The experience of Glen was that of the other schools also, for appreciation was generally expressed at the excellent arrangements and instruction provided.

Reference may be made to the "sheep and wool" course at Grootfontein, which was attended by no less than 130 students, while 49 applicants had to be refused owing to lack of accommodation. While this interest in the course is doubtless due in a measure to the revival of the wool market, the recent formation of several wool-growers' associations (referred to in the August, 1922, issue of the *Journal*), a movement which has engendered a keen desire for instruction in wool-classing, etc., has been the chief incentive.

In addition to the prescribed syllabus of instruction, lectures by prominent men were arranged when possible for the evenings, and the social element is also fostered among the students in the form of occasional dances and social evenings.

The benefit to be derived from these courses is not restricted to the instruction imparted during the regular lectures and demonstrations, but is also to be sought in the opportunities offered for discussion with men who are experts in their subjects, and of observing the farming methods and practice carried out at the institutions at which the courses are held.

South African Ground-nuts: Oversea Confectionery Trade.

In the July and August last issues of the *Journal* reference was made to the oversea market for South African ground-nuts, and the suitability of our product, judged by certain samples that had been sent, for the confectionery trade. A further report from the Trade Commissioner states that the samples in question were submitted to a firm dealing in this class of products, from whom a very favourable report was received, the South African ground-nut being considered better than the Chinese in taste, though it suffered by comparison in colour, the Chinese nut being much whiter, probably owing to bleaching. Due to the fact, however, that our nuts are not known on the market, there appears to be little possibility at present of obtaining c.i.f. buyers, and for this reason the price realized would probably run a little lower than for the Chinese nut, but when better known our nuts should fetch a price equal to the Chinese.

It may be mentioned that arrangements have been made with the Naboomspruit Farmers' Association to forward to the Trade Commissioner, London, a trial consignment of 100 bags of ground-nuts for the purpose of testing the market.

The Irrigated Wheat Soils of Zeerust.

At the request of the Marico Agricultural and Stockbreeders' Society, Mr. Hall, the Research Chemist at the School of Agriculture and Experiment Station, Potchefstroom, went to Zeerust towards the end of 1920 to investigate the diminishing yields of the wheat lands from the standpoint of soil fertility. The result of the investigation has now been published in Bulletin No. 5, 1922, "Some Transvaal Soils."* The three main soil types investigated were: (1) A red loam, (2) a grey, highly calcareous loam ("as-grond"), and (3) a dark brown to black calcareous clay loam (black turf).

The red loam which changed from a sandy and stoney loam to a clay loam, showed the worst nitrification of the three types. It was also the poorest in organic matter, water holding capacity and total nitrogen. Like the other types it also was deficient in phosphates. There was, however, sufficiency of lime and potash. The grey, highly calcareous loam ("as-grond") is a striking soil composed of 50 to 96 per cent. carbonate of lime. It is easily worked, has a good water-holding capacity, and is economical of water. It is well supplied with nitrogen and potash, but deficient in phosphates. A complete fertilizer experiment with potatoes on this soil type was also carried out. The experiment shows strikingly the value of phosphate with manure for potato production. The black turf is well supplied in organic matter and lime, but is very deficient in phosphates and potash. All these soils show fairly good nitrifying powers, especially the grey calcareous loam, which even in the third foot samples showed good nitrification. These soils have been cropped continuously for the last 60 years, and to-day, despite heavy dressings of farm manure, produce wheat which gives a good yield of straw, but little grain.

The addition of kraal and stable manure to soils well supplied with nitrogen and potash but deficient in phosphates, is apt to produce crops of this nature, as the manure is most deficient in the same ingredient that the soil lacks, viz., phosphates. Farmers are advised not to discontinue the use of manure, but to reinforce it with phosphates The use of 200 lb. per acre per annum of superphosphate is advocated.

The bulletin also refers to the satisfying results obtained by a Zeerust farmer, who followed Mr. Hall's advice. Farmers are advised also where manure is unobtainable to grow summer legumes, and to try potash as well as phosphates on the black turf soil along the watercourses.

Soils of the Eastern Transvaal Low Veld.

The same bulletin (No. 5, 1922) referred to above, contains an account of Mr. Hall's soil investigations in the Eastern Transvaal low veld. This part of the country is being rapidly taken up by a fine type of settler, and many inquiries concerning the needs of the soils and the fertilization of semi-tropical crops are received. Last year Mr. Hall spent several weeks in the Barberton district holding meetings, visiting farms and studying the main soil types, which appear to be chiefly of granitic origin and mainly (*a*) a grey, coarse, sandy loam, and (*b*) a red loam, which changes in some phases to a sandy loam, and in others to a clayey loam.

* Obtainable on application to this office. Price 3d. prepaid.

The bulletin discusses the geological origin of the soils and data on their physical and chemical composition, and their deficiencies and treatment. The whole subject of soil fertility is also dealt with, and will be of general interest to all farmers in the Union.

The soils were also tested biochemically for their powers of nitrification, and were found to be very deficient in phosphates, and Mr. Hall is of the opinion that an application of phosphates will be profitable anywhere in this granitic area; it extends from the eastern escarpment of the Drakensberg, westward to the Lebombo Mountains, and south from the vicinity of Piet Retief right up northwards to Leydsdorp and the Letaba River, and again to westward of the last-mentioned places. Some of the soils too are deficient in organic matter and nitrogen. Some have a low potash content, unusual in soils of granitic origin. On the other hand the soils which are low in lime content did not have an acid reaction for the most part, the highest lime requirement according to the Veitch Method being 2455 lb. per acre of carbonate of lime

The use of 200 to 400 lb. of phosphates per acre is recommended for all crops on these granitic soils. On some soils 50 to 100 lb. of sulphate of potash per acre are also likely to be profitable. This should be ascertained by trial. For lime loving crops an application of 500 to 1000 lb. of limestone per acre would also be necessary. The growing of legumes should be a regular practice, and the dwellers in those parts are particularly fortunate, being able to grow both winter and summer legumes to keep up the organic matter and nitrogen content of their soils. Although nitrification appears quite good there must be some organic matter for the bacteria to nitrify.

The bulletin contains some valuable tables showing what the various crops take out of the soil; the fertilizer practice of various countries with regard to producing quantity and quality in semi-tropical fruits; and fertilizer mixtures. The latest fertilizer advice, straight from the directors of the citrus experiment stations in California and Florida, is given, and Mr. Hall is of the opinion that the Florida results are more applicable to Barberton and South African conditions generally than the Californian, as the latter soils are much richer in phosphates than ours.

Altogether the bulletin contains very valuable information on some of the soil types of South Africa and is well worth the careful attention of farmers.

Wood-Destroying Fungi in the Orchard.

Attention is directed to a Science Bulletin,* No. 25, just issued by the Department, and entitled "The Biology of *Schizophyllum commune*, Fries, with Special Reference to its Parasitism." It is written by Mr. Putterill of the Division of Botany, and records the investigations carried out by him on this fungus, the object in view being to obtain further data respecting its mode of life, and whether it might be considered a true parasite or not. A brief account of the occurrence of this fungus is given in the notes furnished by Mr. Putterill under the heading of "Plant Diseases in the Western Province," published elsewhere in this issue.

* Obtainable on application to this office. Price 3d. prepaid.

Fruit and Vegetables: A Large Advertising Campaign.

South Africa has reached a stage of agricultural development where it is impelled to improve the marketing system so as to secure an adequate outlet and return for the produce of the farmer. This need has aroused the producer, and the movement in the direction of co-operative effort that is now discussed whenever farmers foregather, shows that there has commenced that which is destined, perhaps, to stand out in history as the dawn of a new era in the well-being of the country. That agriculture is our chief industry is acknowledged, and it is fitting that the present spirit of co-operation and self-help comes direct from the farmer. Based on this foundation, and with the oft-expressed recognition that loyalty and sound business methods are essential, there exist the factors that ensure success. An early forerunner of the new spirit is seen in the Fruit Growers' Exchange that has recently been formed, while similar enterprise is imminent in other branches of production. It is at a time such as this that interest is drawn to the experiences of other countries and courage derived from the splendid results that have rewarded their efforts at co-operative marketing. There is the outstanding example of the orange growers of California, who through organized effort aided by specialized advertising, increased the sale of their product by 80 per cent. in the short space of twelve years. Similar success attended the enterprise of the citrus fruit growers of Florida. These were pioneer movements in effecting the sale of perishable produce: to-day there exist in the same country many co-operative companies which, with the aid of extensive advertising, are reaping handsome returns.

In England a bold and far-reaching scheme has recently been advocated by the National Federation of Fruit and Potato Trades Associations, Limited. Directed by a propaganda council consisting of unimpeachable trustees, it is proposed to bring the producer and distributor together for the purpose of regulating and stimulating the trade in fresh fruit and vegetables. The objects are (1) to increase the public demand for fruit and vegetables at all seasons and when particular varieties are in season; (2) to avoid, by stimulating demand in this way, the wasted produce in "glutted" markets; and (3) to maintain a higher price average through the increased demand. The funds for this campaign will be met by growers contributing ½d. for each £1 realized on the market by the sale of their produce, and by distributors contributing ½d. for each £1 value of the above produce that has been handled by them.

This is a great undertaking: the wholesale value of fruit and vegetables grown in the United Kingdom is estimated at not less than forty million pounds annually, in addition to which fifty-three million pounds' worth are imported every year. It will naturally be carried out on proper business lines, and the propaganda council proposes to establish reporting and collecting centres at various points in the country and to control the administration of these. This will be conducted economically by utilizing existing organizations to the fullest possible extent. No section of the trade will be favoured above another: the policy behind the whole undertaking will be "progress with equity."

Foremost in the council's plans is a thoroughly extensive advertising campaign. In the first place, it is intended by this means to

create the proper "atmosphere" by constantly bringing home to the public the healthful properties of fruit and vegetables. By every possible and improved means of advertising public opinion is to be changed from a passive to an active belief in the enormous advantages of a regular fruit and vegetable diet. Having aroused this interest (and it will be maintained by continued advertisement), the next object of the campaign will be to speed up the demand for specific fruits and vegetables in their season. This will be done by preparing in advance a series of advertisements dealing with the various fruits and vegetables which are liable to be supplied in excess of demand or which could be supplied in greater quantity if the demand could be increased. At present the trade is under a great disability through large quantities of produce having to be destroyed because nobody will buy in time. A schedule is to be prepared showing the seasons all fruits and vegetables are due to appear upon the market, and the distributing centres to which the various products are usually sent and the best market for them, taking possible demand and the facilities for rapid transport into account. Meanwhile advance advertisements will tell the housewife the special virtues of the particular product, how best to dress it, serve it, or preserve it; will tell her about the crop, how it promises, what advantages it will mean for her; and then at the psychological moment will announce the arrival on the market, urge her to buy or order straightaway, and so work up the interest to the culminating point.

A campaign such as is proposed would cost little more than £100,000 a year, equal to one-tenth of one per cent. of the trade. Given the proper support, the council is sanguine of early and continued success, and is convinced that all will benefit at once from the increased demand for the produce, which would be sold more rapidly on arrival at market, and that the whole process of speeding up sales will tend to harden prices. In the light of American successes the council's optimism is warranted.

The enormous power of advertising has been demonstrated over and over again. It is the most effective and economical method of effecting sales. It has been the means of successfully creating an entirely new public demand. Hundreds of commodities are in universal demand to-day, because they are consistently kept before the public by advertising. There is no reason why the conspicuous successes achieved in other countries cannot also follow co-operative advertising and marketing of South African products. What co-operation has done in other countries, and the campaign now being organized in England, should give food for thought to every farmer in the Union who desires to enjoy without delay the practical benefits that he knows are the result of concerted action.

The Position of East Coast Fever.

At the recent conference of the Transvaal Agricultural Union, Mr. Borthwick, Principal Veterinary Officer, reviewed the position of East Coast fever in the Transvaal as at the end of June last. There were then nine districts in which the disease was present, infection having spread to three new districts (Middelburg, Waterberg, and Carolina) during the year. On the other hand, however, the

actual number of infected farms and locations showed a considerable falling off compared with the previous years. The spread of the disease to these new districts was a source of keen disappointment to the Department, and as a result of careful inquiry the reason for the new outbreaks is attributed in each case to the unlawful movements of stock. Steps were taken, of course, to cope with the outbreaks, and it is not anticipated that any extensive mortality will follow, and there is every likelihood of the disease being stamped out before it can spread further.

In the districts that were previously infected, Mr. Borthwick was able to show that on the whole progress had been made; in Pietersburg and Barberton there had been splendid progress, the number of infected farms having been reduced to three only in each district, while in Lydenburg there was only one such farm. In the Piet Retief District there was a regrettable setback, eleven fresh outbreaks occurring, infection spreading mainly by means of transport oxen. Fortunately, the mortality on the majority of the farms had been negligible, though some have suffered somewhat severely. Had it not been for the reintroduction of this fresh infection, one farm only would have remained under quarantine at the end of June. In Zoutpansberg District the number of infected farms was very considerably reduced during the past year, thirty-seven farms having become clean. There were, however, eleven fresh outbreaks, all of which, with one exception, were in the Sibasa area. While previously conditions in this area made it most difficult to control the disease, much improvement has since been effected and hand-dressing operations are now being systematically carried out, resulting in a marked diminution in the death-rate of stock. Although Pretoria District continues to be the chief centre of disease in the Transvaal, and 35 outbreaks occurred during the year, it should not be taken as an indication that progress has not been made. The new outbreaks came as no surprise, as it was known that enormous numbers of pathogenic ticks were allowed to accumulate before dipping was introduced on the majority of the infected farms in the bushveld, and most of the outbreaks were merely an extension of the disease on the buffer farms. Moreover, the erection of dipping tanks was not effected as rapidly as could have been wished, and on many of the bushveld farms dipping could only be commenced towards the end of June, 1921. Comparatively few deaths have followed these outbreaks, and the Department has reason to be satisfied with its efforts in that part of the district. Surprisingly few deaths (750) were recorded during the year in the Pretoria District, and it is evident that the dipping operations have proved most effective. If the present system of supervision and control is maintained, it is very likely that within the course of the next twelve months, East Coast fever may be almost entirely wiped out of the district.

In Natal, it may be added, the position at the end of June last showed an appreciable improvement, although there had been setbacks in some districts which were looked upon as clean areas and in which dipping operations were not supervised but were left to the stockowners themselves. At present the Veterinary Staff is able to pay attention only to the infected and buffer farms, but were it possible to extend such supervision to all areas open to infection, East Coast fever would be within measurable distance of eradication.

In Umvoti and Estcourt, considered to be the worst infected districts last summer, much headway has been made; also in Zululand. On the other hand, setbacks were experienced in Vryheid, Paulpietersburg, Babanango, Utrecht, Camperdown, Richmond, Ixopo, and Lower Tugela Districts. The position, however, on infected farms throughout the Province is hopeful, and if nothing unforeseen occurs a large area should be clean in the course of the next six months.

In the Transkeian Territories there has, unfortunately, been a recrudescence of East Coast fever in several districts owing to a series of happenings, such as the extensive movements of stock necessitated by the drought and the failure of water supply, excessive rains following drought preventing dipping, illicit movements of cattle, evasion of dipping, natural slackness of the native, insufficiency of dipping tanks, etc. In this part of the Union there are vast, unfenced areas, almost entirely occupied by natives, that render illicit movements easy, and the natives will not divulge anything against each other, nor does the trader care to jeopardize his business by doing so. Transport movements by means of raw oxen, which conditions render a necessary evil, also tend to keep the disease alive. Several districts, however, are free of the disease, and although it has again appeared in four districts, there is reason to expect that they will within a reasonable time be clean once more. In eastern Pondoland there has been a decided improvement. Umzimkulu District, with its varying physical and social conditions, causes most anxiety at present: in it the natives own large numbers of goats which, not being dipped, do much in the breeding of ticks. It was here also that an instance in which inferior dipping material was used, led, it is believed, to serious recurrences of East Coast fever. It is anticipated, however, that before another year has sped, this district also will be much improved.

On the whole, therefore, it is clear that while setbacks have occurred, the country is shaking off the disease, and with a continuance of systematic dipping and controlled movements of stock it should speedily diminish.

New Development in the Poultry Industry.

The views of the Department in regard to the suggested creation of a Poultry Division were given in the February, 1922, issue of the *Journal*, when it was stated that while such a division was not likely to be instituted for some years, an alternative presented itself in the appointment of a chief poultry officer. Since then the Agricultural Products Grading Act, 1922, has been passed and under its provisions, and the outcome of the spirit of self-help shown by those engaged in the poultry industry, a Government Notice (No. 1390, 1922) has been published providing for the levy of 9d. per case to be paid by the exporter on consignments of eggs exported from the Union; this is additional to the ordinary inspection fee of 3d. per case. There are anticipations of low prices ruling for eggs on the oversea market, and it is not known at present what the volume of the coming season's egg export trade will be. It is not expected that there will be very many consignments shipped from Durban; there will probably

be a trial shipment from Port Elizabeth with a view to a regular trade later on if the experiment shows this to be feasible. The bulk of the season's exports will, therefore, go through Capetown. While the volume of the season's egg export trade is thus vague, and consequently the amount to be derived from the levy uncertain, the Government has necessarily to move with circumspection, but arrangements have already been made for the appointment, temporarily for the time being, of a chief poultry officer. Mr. Bourlay, the Lecturer in Poultry at the Potchefstroom School of Agriculture, has been seconded to fill this post, and he will arrange for and supervise the carrying out of the inspection work at the ports undertaken in accordance with the egg export regulations. Concurrently as far as possible, and between the egg export seasons, he will initiate and develop a better organization of the poultry industry. He will advise the Department on matters affecting the industry generally, as well as regulate and co-ordinate instruction in poultry at its educational centres. At the same time, and for the present, he will keep in direct touch with his duties at Potchefstroom.

In addition to the above post, two others are to be created; there will be an Egg Inspector and Itinerary Poultry Instructor for Capetown, and one for Durban. One of the vacancies has already been filled in the person of Mr. H. Leitch Anderson, who has now taken up his duties in Capetown. In view, however, of the small volume of trade that is expected to pass through Durban, it is not proposed to fill the other vacancy just yet, but to arrange for Mr. Cross, the Poultry Lecturer at the Cedara School of Agriculture, to carry out whatever inspection may be needed this season at that port. The duties attached to these two posts are the inspection of eggs intended for export and itinerant instruction work, under the direction of the chief poultry officer, between the export seasons.

The great advance that the past few years have seen in the poultry industry of the Union, is due in large measure to the enthusiasm and labours of those engaged in it, and it is fitting that they should be among the first to avail themselves of the facility for self-help that the Agricultural Products Grading Act presents, for it is the proceeds expected from the levy that will be depended on to defray most of the expense incurred in the new development.

The Export of Lucerne.

Inquiries have recently been made by the Trade Commissioner, London, and the Commissioner of Commerce on the Continent, respecting the working up of an export trade in South African lucerne. As an outcome Mr. Canham reports that though he has spared no effort to obtain some definite idea as to the reception which our lucerne would be likely to meet on the English market, he has not yet succeeded in securing a quotation which might be considered as reliable. He thinks, therefore, that the question as to whether a remunerative trade in South African lucerne could be established in England, can only really be decided by an actual shipment, and if there is a large surplus in the Union for which a market is required, the Trade Commissioner considers it would be worth the while of some

firm to accept the risks and ship, say, not less than ten tons for disposal on the English market. Even if unremunerative the loss would be insignificant, while the trial consignment would indicate very clearly whether the export of lucerne is a feasible proposition or not. It is a matter consequently for local enterprise.

On the Continent, Mr. Spilhaus negotiated with a well-known Rotterdam firm in close business relations with Czecho-Slovakia, and was informed that if the price was acceptable and the quality of the lucerne satisfactory on arrival, they could easily place 10,000 tons or more after the receipt of a trial shipment. Such a shipment, indeed, has now gone forward to this firm, at £7 per ton of 2240 lb. c.i.f. Rotterdam. The price of £7 is not the highest that can be paid, and it is expected that as soon as the quality of South African lucerne is known, better prices will result. This trial consignment consisted of fair average quality lucerne, passed by the Government Grader after examining the lucerne in respect of sweetness, dryness, foreign matter (i.e. containing noxious weeds), sweating (which induces mouldiness) and colour. It may be mentioned that of the quantity sent forward for shipment, a number of bales was rejected by the Government Grader on account of sweating and the colour not being up to standard. In his report the Grader states that there was room for improvement in selecting the hay for baling, and that the baling was not as good as it might be: there were bales round which the wires (three in number) were not tight enough, were not placed at even distances apart, and not round the centre of the bale.

Haymaking this year was very much delayed in England by wet weather, and the yield of meadow hay and seed hay was estimated to be from 15 per cent. to 20 per cent. below the average. This, in conjunction with the low stocks carried over from last season, would indicate a probable scarcity before the end of the year, and it may be that prices will advance and a demand be created for supplies of imported feeding stuff of this character. On the Continent also continual showers of rain made it very difficult for farmers to get in their hay, and it is reported that there will be a considerable shortage of hay in Holland as well as in Germany and Czecho-Slovakia.

The Journal's Index.

The index to Volume IV of the *Journal* has been compiled and will be issued, together with this number, to all recipients of the *Journal*. It comprises 12½ pages of subject items, and as they refer to six numbers only of the *Journal*, it will be seen that the matter is treated very comprehensively. An index of this nature is of great assistance to all engaged in the industry of agriculture, and we would urge readers to have each index bound together with the numbers of the *Journal* it covers. Every volume will contain sound and useful information which, emanating from the Department entrusted with the development of agriculture in all its branches, will be of lasting help to every farmer in South Africa, for its value is constant and does not pass with the years.

The Agricultural Pests Act.

There is published elsewhere in this issue of the *Journal* the second instalment to the series of principal Acts and Regulations administered by the Department, a résumé of each of which it is proposed to publish in the *Journal*. Last month the Diseases of Stock Act, that enters so largely into the life of most farmers, was dealt with. Its object is to prevent disease among live stock. The present instalment deals with the Act (and its regulations) designed to prevent the introduction and spread of insect pests, plant diseases and bee diseases, and to regulate the importation of exotic animals. Both Acts were among the first legislative measures passed by the Union Government, and conjointly they rank high among those that ensure the best interests of pastoralists and agriculturists in South Africa. It is the experience of other countries that much of the hardship farmers have to contend with in the form of insect pests and plant diseases could have been avoided or minimized by a rigorous policy of inspection of plants, etc., prior to introduction. In earlier days this was perhaps not always possible, but to-day the policy is to take every precaution in this direction. In South Africa most of the troublesome insect pests and plant diseases that infest gardens and orchards were introduced with plants from oversea. Other pests are liable to be introduced notwithstanding every precaution. The Agricultural Pests Act of 1911 is, however, a great safeguard, and the public should not fail to comply with its requirements, since they are designed to protect the interests of the community generally. It must always be remembered that oversea traffic in plants, is controlled by conditional permits issued by the Division of Entomology, Pretoria. Requests for any further information in regard to the requirements of the Act should be made to this Division.

Experiments in the Control of Codling-moth: A New Bulletin.

Experiments in the control of codling-moth have been in progress for several years at the Elsenburg School of Agriculture and Experiment Station, and much valuable information has resulted. These experiments and the findings up to the present are fully recorded and discussed by Dr. Pettey in Science Bulletin No. 26, "Experiments in the Control of Codling-moth," which is now in the hands of the Government Printers and may be obtained on application to this office. A summary of this bulletin has been prepared by Dr. Pettey and is published in the present issue of the *Journal*. It contains the latest advice on the subject and will prove of undoubted value to fruit growers.

Union Representatives in Finland.

On the advice of the Commissioner for Commerce on the Continent of Europe, who has represented that there are market possibilities in Finland for the Union's raw products, the Government has appointed Messrs. Piehl and Fehling, of Helsingfors, to act in that country as Honorary Trade Commissioners for the Union.

DEPARTMENTAL ACTIVITIES.

(NOTE.—The work of the several Divisions and Schools of Agriculture covers a wide range of agricultural industry in the Union, and we give hereunder notes and observations from certain of them treating with matters of special interest coming under their purview month by month. The object of these notes, which are not concerned with general routine work, is to inform the farmer of such matters as are calculated to be of interest and helpful to him at the present time.—EDITOR.)

THE DIVISIONS.

ENTOMOLOGY.

Citrus Thrips.—For the past decade or longer this insect has caused considerable injury to both citrus trees in nurseries and fruit on bearing trees in orchards.

This thrips is a very minute four-winged fly, being so small that it usually escapes notice. The insect becomes numerous and most injurious about the time the citrus trees are in bloom. The tender young growth and the setting fruit is gnawed, a curling of the leaves and a whitened irregular zone around the stem end of the fruit being the result. On young nursery stock the damage is often serious, and sometimes a very considerable and unsightly scarring of the fruit occurs. This pest has been observed or reported from practically every citrus-growing centre in the Union.

As experiments on the control of thrips have hitherto not been carried out in South Africa, no definite recommendations can be made, but a review of the results obtained in California and in other places where the pest has done extensive damage may prove interesting and suggestive. In California four applications of lime sulphur at the dosage of one part to eighty parts of water are recommended; the first application being made just after most of the petals have fallen; the second ten or fifteen days later; the third three to four weeks after the second; the fourth when the insects are numerous on the foliage. Lime sulphur sometimes causes a slight burning, but otherwise is very effective, and cheaper than tobacco extract, which is a spray sometimes used for this pest. For tobacco extract, a dilution of one part in 360 parts of water has given good results in California. Spraying, however, for this pest in California has not proved profitable enough to justify its continuance, except in nurseries. Another method which has been favourably reported on is dusting with sulphur.

As far as we know, it has not been used on orchard trees, but has been found to be very effective for thrips control on nursery stock.

Cotton-stainers Again.—The exact cause of cotton-staining is not yet known. It has not been conclusively proved that cotton-stainers are entirely to blame. That cotton-stainers do, at times, cause considerable staining is quite probable, but it is also very probable that other factors must be reckoned with. Among these factors are injuries by bollworms, injuries by sucking insects, bacterial diseases introduced by insect injuries, adverse or abnormal climatic conditions, or abnormalities of an hereditary nature. The following extract from a letter by a correspondent in the eastern Transvaal is interesting, as it shows that enormous numbers of stainers with a minimum of staining is a possibility:—

> "Last season we saw a few of the small cotton-stainer, but saw no damage done to our cotton. This year they appeared in millions with the last picking of cotton, and, although they were in such numbers that they made the cotton appear to be almost black (cotton which we had on benches drying), we found no damage done, and the only stained cotton we had was stained by bollworms. The stained bolls naturally opened before they were mature through being damaged by bollworms, and as soon as the rain fell on the open bolls it became stained. In spite of a plague of stainers, both large and small, our cotton crop this season is snow-white, and even the last picking shows no staining. We find it a great help if we destroy the large stainers as soon as they hatch out, and they are easily controlled by sending youngsters round early in the morning and knocking the stainers off into enamel bowls, filled with water in which a tablespoonful of paraffin has been poured."

HORTICULTURE.

The Fruit Levy and the Inspection Fee.—In terms of the Fruit Export Act, export fruit is subject to an inspection fee of 1s. 4d. per ton (shipping ton of 40 cubic feet) on all boxes going 25 or less to the ton, and 2s. per ton above this number. The Agricultural Products Grading Act, 1922, now provides the necessary machinery for raising a levy, but before this legislation was passed it was decided by the interests concerned to have a levy of 5s. per ton on export fruit, the proceeds to be devoted to the furtherance of the industry. In the absence of the required legislation, it was decided to add this 5s. per ton to the existing inspection fee, and this was accordingly done, the Government collecting the total fee of 6s. 4d. or 7s. and paying over to the Fruit Growers' Exchange its portion of 5s. per ton. The passing of the Grading Act referred to above has now enabled the matter to be put on a proper footing: Government Notices Nos. 1448 and 1452 appearing in the *Government Gazette* of the 8th September, 1922, provide for the inspection fee as heretofore and for the special levy, both having effect as from the 12th July last.

BOTANY.

A New Appointment.—Since the resignation of Dr. Van.der Bijl there has been no mycologist stationed in Durban, and the pathological work at the Natal Herbarium has been at a standstill. This post has now been filled by the appointment of Mr. H. H. Storey, B.A. Farmers and fruit growers in Natal will be glad to learn that special attention can now be given to the study of plant diseases under local conditions, and are invited to address any inquiries which they wish to make on the subject of diseased plants to the Mycologist in Charge, Natal Herbarium, Durban.

Apple-branch Blister.—A number of apple and pear twigs recently sent for examination have proved to be infected with the fungus *Coniothecium chomatosporum*, which causes the apple-cracking disease. This fungus produces on the twigs and branches a number of dark specks, usually in groups and frequently reddish brown, irregularly raised, blisters result. This appearance has led to the above name being applied to the disease. Usually the branches are not seriously affected, but unless preventive measures are applied, the fruit on the affected trees will be attacked, and a large number of cracked and russeted apples produced. All twigs noticeably affected should be cut back and destroyed, and the trees drenched in winter with a copper-sulphate solution (1 lb. of bluestone to 25 gallons of water). This is a winter wash and cannot be used after the buds begin to burst. Spraying with bordeaux mixture (4-4-50 formula) should be commenced before the flower-buds open, and should be repeated soon after the blossoms fall, and again when the fruit is well set.

Some Medicinal Plants.—An inquiry has recently been received from a firm in Capetown regarding the production of aniseed, belladonna, and pyrethrum in the Union. This firm is in touch with prospective large buyers in Europe, and is anxious to supply their demands from South Africa. As far as we know, none of these drug plants is cultivated to any extent in this country. The seed of belladonna is difficult to obtain and very expensive. We have tried a small quantity of the seed here, but so far without very satisfactory results. Belladonna requires a rich garden loam, moderately tight and sandy, and well fertilized; it is a perennial. Aniseed is the product of an annual plant known botanically as *Pimpinella anisum*. It belongs to the same family as fennel, dill, etc. We have not carried out any experiments with it, but there seems no reason why it should not do well in this country. It also requires good loamy soil and considerable heat to mature the crop. The same remarks apply to the third drug, *Pyrethrum cinerarifolium*, an annual with daisy-like flowers having strong odour. This plant is an insecticide, and is the source of a well-known brand of insect powder. This powder consists solely of the dried and powdered flower-heads gathered for the purpose before they are fully open. South African conditions would appear to be ideal for this crop.

Should any one be sufficiently interested to wish to experiment with any of these medicinal plants further information on the subject could no doubt be obtained.

Leaf-curl (*Taphrina deformans*, Fckl. Tul.) is beginning to show on peach trees in some districts. This disease can be detected as soon as the leaf buds have partly unfolded; the colour of the diseased leaves is darker than normal or they are distinctly reddish and become conspicuously arched and curled. As the leaves approach maturity, the swollen distorted leaf surface becomes pale and finally greyish or mealy in appearance. Since infection only occurs in the early spring, preventive measures must be applied in the winter, so that the fungous spores may be killed before they germinate. It is therefore too late to treat trees which are now showing leaf-curl, but such trees should be noted, and should be sprayed next winter, or in the early spring just before the opening of the buds, with the copper-sulphate solution recommended for the apple-cracking disease. From 90 to 95 per cent. of the infections can be prevented in this way.

National Herbarium.—South-West Africa is a territory of special interest to the botanist, but is poorly represented in the Herbarium, partly owing to the comparative inaccessibility of some of its districts. A valuable set of specimens has recently been purchased from Dinter, a well-known plant collector, who has been travelling in South-West Africa, and these will be a welcome addition to the National Herbarium.

It is important that the identity of our forest trees should be established before any exact record can be kept of their growth and economic value. The indigenous forests of the Union have still many trees which are unknown to science, and recently two specimens submitted by the Forest Department proved to be an undescribed species of *Homalium*.

DAIRYING.

Proposed New Milk Record Scheme.—A new general scheme for testing cows in the Union, embracing both pure-bred and grade animals, is under the consideration of the Department and is also being discussed by the various Pure Breed Societies, as well as Dairyman's Associations. The adoption of this scheme should prove of immense value to the dairy industry of the Union, as the farmer who owns grade cattle will be in a position to have his herd regularly tested at a reasonable figure, and will thus be able to eliminate the "robber" cows from his herd, and only breed from those which show a fairly decent return for the labour expended on them during their lactation period. This weeding out process is highly essential, as farmers continue to breed year in and year out from "robber" cows which do not pay for their keep, and the progeny of such cows instead of showing improvement, do just the reverse. It is considered that by widening the scope of the existing Milk Recording scheme and encouraging a far larger number of breeders to enter more animals for the test, eventually a scheme of this nature will, from a financial point of view, be carried out more economically, than is the case at the present time.

Preserving Butter for Home Use.—Numerous inquiries have been received by this Division for preserving butter for home use on the farm during the season of scarcity. There are two methods of keeping butter, viz.:—

Preserving same in glazed earthernware jars, or enamelled vessels, and the other, by making the butter into pound pats and keeping same submersed in brine. The main point which the butter-maker has to observe, is to have the cream in a sound condition for churning purposes, as without this precaution, neither method of preserving butter will be of any use. Cream used for keeping purposes should not contain too high a lactic acid content, but should have just a slight, clean, acid flavour at the time of churning. Great care must be exercised in washing every particle of butter-milk out of the butter when same is in the granular stage, and the last washing of such butter should be in the form of brine, allowing same to remain on the butter for ten minutes; the butter is then worked in the usual way, and from three quarters to one ounce of fine dairy salt should be added to each pound of butter. After working the salt into the butter in the usual way, the butter should be put aside for an hour or so in order to allow the salt to dissolve, and then again re-worked, which prevents the butter being streaky, and gives a more even distribution of the salt in the butter itself. The butter is then placed in either glazed earthernware jars, which have previously been well scalded (and of course allowed to cool before the butter is placed in same), or unchipped enamel vessels which must be treated in the same manner as the jars; whichever class of vessel is used the butter must be firmly pressed in, allowing no crevices for air to collect, which deteriorates the keeping quality of the butter. The jar or vessel containing the butter should be filled within a half or quarter of an inch from the top, and the surface of the butter should then be covered with grease-proof butterpaper, cut slightly larger than the circumference of the jar, in order that the ends can be turned up round the sides of the jar. The surface should now be completely covered with a layer of fine dairy salt pressed firmly down on the butterpaper, and the top of the jar again covered with grease-proof paper tied tightly round the jar; this hermetically seals the butter, and provided the cream at time of churning was in a proper condition, the butter so treated should keep good for several months.

The system of keeping butter in brine has its advantages but it is questionable whether the butter will keep so well. In the brining-system the butter is treated as described above, and then made into pound pats and submersed in brine, which has previously been boiled, and of sufficient strength to float an ordinary sized egg. Great care must be exercised in keeping the butter properly submersed, otherwise it will not be hermetically sealed; pound pats of butter can be wrapped in grease-proof paper before being placed in the brine, but a thread should be tied lengthways round each pat to prevent the paper from coming loose whilst in the brine. The advantage of this system is that the housewife can take a pound of butter out of the brine for use, and at the same time the remainder of the butter still remains hermetically sealed in the brine. If the butter is to be kept for a lengthy period, it may be advisable to use a fresh lot of brine after a couple of months.

VITICULTURE.

The Making of Hermitage Wine.—In order to meet inquiries on this subject, the following brief outline is given. Pick the grapes when well ripe, but not too ripe, say 20-22 per cent. sugar, and pick only good grapes. Put through the crusher, but see that the rollers are not too closely set to make sure that no seeds are crushed. It is presumed that the machine employed removes the stalks. Run the must and dops into a fermenting tank and add potassium meta-bisulphite at the rate of 6 oz. per ton of grapes. It must be remembered that the amount of meta added will differ according to circumstances. If grapes are very hot when they come to the cellar, add as much as 8 oz. per ton, but if very cold it can be cut down to 4 oz. Whether it is needed to add any tartaric acid will depend on the acidity of the grapes, but it is a good practice always to add the same amount of tartaric acid as meta used. This amount of tartaric acid can be used without taking the acidity of the must into consideration, as very little of it will afterwards be found in the wine. The tartaric acid will help to give a sound fermentation, will help to extract colour, and the resulting wine will have a nice clean taste. As soon as fermentation starts the dops will rise to the top; this must be pressed down every three hours, or oftener if possible. Theoretically this should be attended to night and day. As it is often impossible, however, for the farmer to do this during the night, he should press down the dops the last thing of an evening, and then make a solution of meta and water, which is sprayed over the tank. This will keep the dops sweet for the night. The steeping should be done again early in the morning. A tumblerful of water is enough for a tank if a fine spray is used. As soon as the colour of the must is dark enough, draw off and pump into a clean cask. If the must and dops are treated as mentioned above, draw off after two and a half to three and a half days; it is very seldom necessary to ferment for a longer period. If the dops are pressed at once, and the press is not worked too hard, the press must can be added to the wine. If the dops are pressed a second time, the must coming off from the press must be kept separate as press wine. During the fermentation the temperature must be carefully watched; if it rises above 90° F. steps must be taken to cool it down by whatever means are available. Space prevents a discussion here of the different means of controlling temperature in the cellar.

After the must has been racked from the fermenting-tank to the cask the temperature must be watched too. As soon as fermentation is finished give the wine a racking. Rack again eight to fourteen days later. These two rackings are very important, especially if meta-bisulphite has been used; if neglected the wine may develop a bad smell, and so necessitate labour to rectify. After the second racking the wine should be fairly clear within three to four weeks' time. A third racking is then given, which is usually enough to carry it through the winter months. If the wine is not yet sold, rack again in August, together with a good sulphuring, just before the warm weather sets in. The previous rackings may be done without sulphuring the casks, although a light sulphuring is advisable just to thoroughly disinfect the casks.

It is very advisable to attend the Short Course in wine-making at Elsenburg, which is held during the summer months every year. The course generally begins on the first Monday after New Year's day, and lasts for a week.

CHEMISTRY.

Organization of the Division.—The Division of Chemistry as organized at present is composed of seven laboratories, one each at Capetown, Pretoria, and the five Schools of Agriculture. The Chief is stationed at Capetown, and the next two senior officers are at Pretoria and the Grootfontein School of Agriculture, Middelburg, Cape. These three officers are thus situated most conveniently to the populous agricultural areas of the Union, while in addition the five school laboratories are so distributed as to bring most parts of the country within easy reach of one or other of the agricultural chemists. The control and guidance of agricultural chemical research is vested in the Chief of the Division, to assist whom the services of the chemists at the schools are utilized to the fullest extent possible. Thus, with the greatest benefit to those teaching agricultural chemistry at the schools of agriculture, that research is expected to be inspired and co-ordinated by the Chief of the Division. At the same time the chemists at the schools have every opportunity for initiating and wide freedom in carrying out research so as to afford full scope for individuality.

Each of the seven laboratories is supplied periodically by the Chief of the Division with a list of all agricultural chemical research work at the other laboratories, and is also advised of their progress. Throughout the course of the work it is the function of the Chief of the Division to act in a directive capacity in consultation with the principal of the school concerned as to the lines of chemical research to be carried out. When a definite stage of progress is reached, or when any special phase of investigation is completed, the chemist who has conducted it furnishes a report to the Chief of the Division. It may be stated that as many as twenty-six items of chemical investigation have been more or less completely studied and reported upon, while fifty-three items are still receiving attention, a heavy volume of work, and if even the bare majority leads to definite conclusions, it will be a very notable advance. In addition to this work, which may be termed the indoor side of the Department's agricultural chemical research, there is also the fieldwork in the form of field and other experiments in which the chemist plays an important part and which covers a wide range.

One branch of work may be specially referred to, and that is the agricultural soil survey. It is under the direction of the senior chemist of the division stationed at Grootfontein who, in consultation with the Chief, will develop the scheme of operations. In South Africa there have been large numbers of soil analyses, both chemical and mechanical, but for the most part these have been isolated units without any of the coherence that a systematically conducted survey affords. Necessarily some time must, under the most favourable circumstances, elapse in getting a systematic soil survey into swing, and while the initiation of the work is at present somewhat hampered, a commencement has already been made.

THE SCHOOLS OF AGRICULTURE AND EXPERIMENT STATIONS.

GROOTFONTEIN, MIDDELBURG (CAPE).

Storage and Sprouting of Potatoes for an Early Crop.—To those in the Karroo interested in the growing of early potatoes, the following observations made at Grootfontein during the past season will be of value.

1. *Digging Early (before Vines Mature).*—By selecting special "hills" from the main crop before it is mature, suitable "seed" for early potatoes can be obtained. This seed is usually much more free from the larvae of tuber moth than the potatoes harvested after the vines have withered. These selected potatoes must then be placed in a cool, well-lighted and ventilated room, in boxes similar to that illustrated in Fig. 1. Potatoes dug on the 10th February and kept in this manner until 21st August are shown in Figs. 1 and 2. A similar lot stored under the same conditions, but in the dark, may be seen in Figs. 3 and 4, where it will be noted how weak and spindly are the sprouts, and how shrunken the tubers themselves as contrasted with the beautifully sturdy, thick sprouts and solid tubers in the case of those kept in the light.

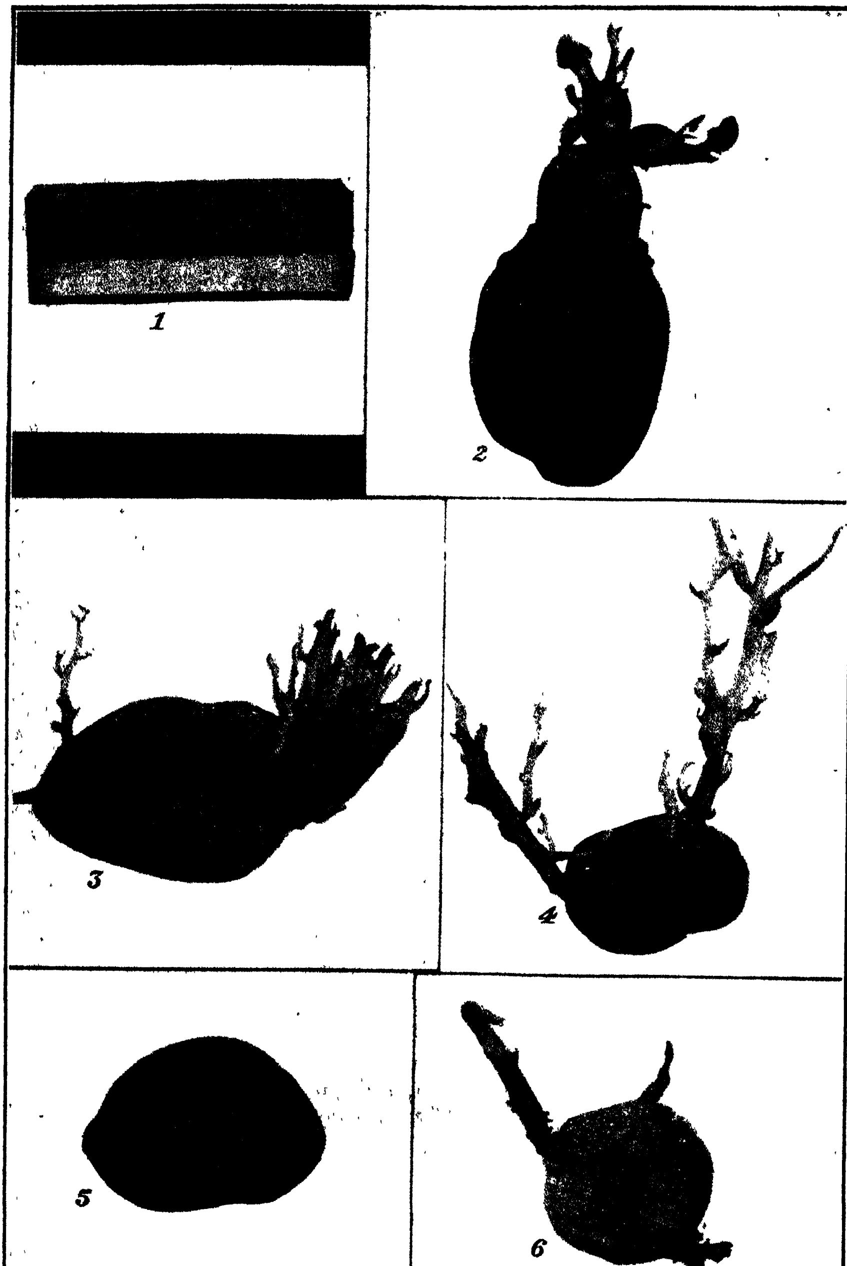
Potatoes such as those shown in the first two illustrations, if planted at the end of August, will in all probability produce a crop suitable for the table two to three weeks earlier than those illustrated in Figs. 3 and 4, where much of the energy of the tuber has been wasted in forming long, weak sprouts that will break off in planting when new sprouts will have to be formed.

2. *Planting Late.*—The second method consists in planting late, say, the end of January or beginning of February, then harvesting in the winter or later, depending on whether the potatoes are wanted for an early or main crop. Such potatoes are shown in Fig. 5. These tubers are firm, and the sprouts barely started. They were harvested on the 13th July from a crop planted on the 17th January. A sample of the same variety harvested in Febuary, and kept in a sack is shown in Fig. 6, where the very shrivelled condition of the tubers, and the long worthless sprouts are very noticeable. The potatoes illustrated in Fig. 5 will, without doubt, produce much more vigorous plants than those shown in Fig. 6.

In order to prepare these winter-harvested potatoes for an early planting, say September, quick sprouting can be induced by placing the tubers in boxes, as in Fig. 1 in a dark warm room for about two to three weeks, and then the sprouts may be toughened by exposing the boxes to bright light for a few weeks, about two to three, before planting.

Sprouting potatoes is of first importance in getting an early crop, but care must be taken not to break oft the healthy sprouts. This is why the sprouting boxes are so useful, for the potatoes may be carted to the field in the boxes, which can easily be made from petrol cases.

Observations made here recently show that by treating sprouted potatoes with formalin, 1 in 300, no injury to the sprouts results.



STORAGE AND SPROUTING OF POTATOES.

FIG. 1.—Sprouted Potatoes in sprouting box. FIG. 2.—Well Sprouted Potato, suitable for early crop. Sprouted in light. FIG. 3.—Poorly Sprouted Potato. Sprouted in dark. FIG. 4.—Long, weak Sprouts and Shrivelled Tuber. Sprouted in dark. FIG. 5.—Late Planted Crop. Harvested in July. FIG. 6.—Early Planted Crop. Harvested February. Stored in sack.

Pig-killing.—During August all students had a good measure of practice at this work. In killing, it was found that severing the jugular vein gave the best results. Sticking to the heart did not allow of effective bleeding.

When dead, the pig was immediately dipped in a vat of water at a temperature of 170° F. In the case of small pigs three-quarters of a minute was found to be long enough to make the hair come away easily, whilst large pigs required up to two minutes. One must be careful not to leave the pig in too long, or to allow it to rest at the bottom of the vat, otherwise the hair will be burnt fast. If a vat is not available in which to scald the pig, scalding may be done by covering the pig with sacks and soaking these with water at a temperature of 180° F. for about 10 minutes.

When cleaning the pig, one should always commence with the head and feet, as these are the most difficult parts to get clean.

These pigs are being converted into bacon by both dry salting and pickling, and a report on the resulting bacon will be published later.

Recipe for Bacon Curing: Dry Cure.—For 500 lb. meat use 50 lb. salt, 5 lb. black or brown sugar, and 2 lb. saltpetre. All ingredients should be well mixed together, and half the total quantity applied at commencement, half of the remainder after three days, and balance after a week. The waste liquid which runs off is to be poured over the whole of the bacon, more being placed on the thick parts, such as hams.

Pig Pickle.—The same quantities of salt, sugar, and saltpetre dissolved in 20 gallons of water will also be sufficient for 500 lb. meat. An immersion of from 10 to 14 days should be enough. After either of the processes has been completed, the meat should be kept for 24 hours in a solution of 1 lb. bicarbonate of soda dissolved in 20 gallons of water. This will remove all excessive saltiness. The meat must now be hung up to dry for at least three days, when it is ready either for smoking or painting with essence of smoke.

Inquiries regarding bacon-making are invited by this Institution.

Special Course in Ostriches and Feathers.—This course, which will extend over a period of two months during the ostrich-breeding season, will commence early in October. The object is to afford a thorough grounding in both the theory and practice of ostrich farming. Particular attention will be given to training students in the judging of all classes of feathers, and particularly in teaching them to realize the type of feather the present-day market requires. Ten students only will be accepted, so that each will receive personal attention.

This is the first course of its kind that has been attempted, and every endeavour will be made to make it as successful as possible, for it is felt that it will be the means of materially helping all who participate in it. It offers an opportunity to those farmers who wish to be prepared for a revival in the ostrich-feather trade, to study the best methods of organizing this branch of their farming activities, and thus take full advantage of any revival that may eventuate,

GLEN, ORANGE FREE STATE.

Short Courses.—The five Short Courses, each of five days' duration, were attended by 129 individuals. Of this number, 97 were farmers and farmers' wives and daughters. The substitution of Special Five Days' Courses for the two or three weeks' courses has been fully justified.

Special Poultry Course.—The Special Poultry Course of five months commenced on the 24th July, and fourteen students were admitted. The course is a thorough one, and includes allied subjects such as horticulture, field husbandry, engineering, and entomology. In the practical work on the poultry plant each student is required to manage a miniature plant, run an incubator, and rear the chicks.

Training of Teachers in Agriculture.—By Administrator's Notice No. 38 of 1922 it has been arranged that henceforth the diploma of the Glen School of Agriculture will be accepted by the Administrator of the Orange Free State as a qualification (equivalent to First Year's B.A. Course) for admission to the Higher Primary Teacher's Certificate Examination. The result of this is that students in possession of the Matriculation or Orange Free State School Leaving Certificate, and the Diploma of the Glen School of Agriculture, will be able to obtain the Higher Primary Teacher's Certificate after one year at a Normal College. The Orange Free State education authorities have for some time past been striving to introduce agriculture into their secondary and rural schools, but they have been faced with a lack of men properly qualified for this work. It is anticipated that the regulation now promulgated will provide the necessary teachers, and the body responsible for the arrangement is to be congratulated on the step taken.

Municipal Plantations, Kimberley.—The City Engineer at Kimberley is at present undertaking "an experiment" which may yet prove of interest and economical importance to the dry parts of the country. He is trying to establish a big plantation of gums (*Rostrata*) and pines (*Halepensis*) on the soils of Kimberley. For the last fifteen or more years enterprising companies have been trying to establish forests on those "Kalahari soils"—without success. The problem has now been tackled in a scientific way, and there is a great possibility that some of those apparently arid soils will yet be covered with verdant forests. It is to be hoped that the laudable example of the Kimberley Municipality will instigate tree-planting in those parts of the country where at present only an occasional mimosa breaks the monotony of the veld.

Kaffir River.—The Lecturers in Engineering and Chemistry have recently visited a farm on the Kaffir River. They were struck with the permanency of the water in that little tributary of the Riet River. Although the Kaffir River has not flowed since the end of last year, it still contains sufficient water to last those farms through many months of drought. By the aid of suction gas-engines the farmers irrigate extensively along the river banks. The chief feature about this river is that it runs on the blue shale bed-rock, with the result that the river-bed retains its depth, the water in pools does not seep away, and along its banks there is hardly any soil erosion. The big irrigation scheme higher up along the river has recently been completed, allowing a large area of arable land to come under irrigation,

Extension Work—Irrigation-farming in Griqualand West.—The Horticulturist and Chemist have recently visited various parts of Griqualand West and spent their time profitably amongst the farmers of that part of our area. On account of the low rainfall in western Orange Free State and Griqualand West this portion of the country is often regarded as being too dry for agriculture—crops and trees. However, with the big rivers running through that area, the possibilities for development under irrigation schemes are great. Along the banks of the Vaal and the Modder Rivers, farmers are gradually realizing the good prospects for fruit-growing. On one farm on the Vaal River an orchard of five thousand deciduous fruit trees will be in full bearing in a year or two. The soil seems excellent for the purpose, and so is the irrigation water. All that appears to be necessary is enterprise in developing bigger irrigation schemes and financial support for this. The fruit industry in those parts is so young that the farmers are as yet handicapped by a lack of experience in the new line. This is obvious from their methods of tree-pruning, fruit-packing, etc. Generally speaking, however, it seems that there are great prospects for fruit-growing in that "desert" part of our area. In fact, even at present the farmers at Ritchie, on the Modder River, are rapidly progressing on their small "fruit and vegetable" farms.

Co-operative Experiments with Farmers.—The Chemist and Assistant Experimentalist are conducting manurial experiments with potatoes on two farms near Petrusburg. It is hoped that by these co-operative experiments we shall not only gain experimental evidence of the manurial needs of those soils, but also assist the Petrusburg farmers materially in their potato culture. The potato is practically the only crop cultivated in that district.

POTCHEFSTROOM, TRANSVAAL.

Maize-growing Competition for Lads.—One of the competitors (aged 17) in the maize-growing competition organized by this institution, secured at the Western Transvaal Maize Show (30th August) a first and champion prize, as well as the grand champion prize for the best single maize-cob on the show, and at the recent Witwatersrand Maize Show the judges spoke highly of the quality of the exhibits in the juvenile section, which compared very favourably with the exhibits in the senior classes. These show successes are gratifying, and the field results obtained by the lads in this competition also call for special reference. From their one-acre plots several secured yields of 7, 12, and 18 bags; at Kinross one harvested no less than 22½ bags of grain from his acre.

During the past season 163 lads participated in the competition, the report on which is in preparation. For the coming season close on 300 have already enrolled. The *Farmer's Weekly* has offered a silver medal for the current season's competition and also another medal, should a competition materialize in the north-west Free State. The *Landbou Weekblad* has made a similar offer. Mr. J. Neser, of Klerksdorp, has kindly offered to donate a ten-guinea cup for the Western Transvaal area. Two more cups are required, one for the high veld and one for the low veld.

CEDARA, NATAL.

Commercial Beans.—The white bean is preferable for export. The following varieties of white dwarf beans did well at Cedara during the season 1921-22 (yield per acre in brackets):—White Dwarf (1500 lb.), White Haricot (1250 lb.), White Canadian Wonder (1000 lb.), Flageolette (940 lb.). Sugar-beans have also done well. These supply a local demand. Natal Sugar and Best of All were found most suitable at Cedara, the yield per acre being 1400 lb. and 1000 lb. respectively.

Of runner beans, the Bomba proved the most prolific, giving a yield of over 1000 lb. per acre; it is, however, an awkward bean to handle on a large scale, owing to irregular ripening of pods. Of the abovementioned varieties of White Dwarf beans, the "White Haricot" would be a good commercial bean to grow. The "White Dwarf" is a variety which has been undergoing trial for three seasons, and was originally started with only a small quantity of seed, so there is not sufficient seed available for planting on a large scale.

Bone meal has proved to be a very efficient fertilizer, used at the rate of 250 lb. per acre. As a quick acting fertilizer, 20 per cent. superphosphate would be very useful.

The best results at Cedara were obtained from seed sown early in November. The varieties named flowered in 44 days, podded in 54 days, and were harvested as dry beans in 90 days. Beans sown at a later period (December to January) produce flowers at a time when the Mylabris is particularly active, and consequently very few pods are formed. Beans sown late in January matured in 90 days, but did not crop as well as those planted in November.

Field Operations for October.—The farmer's attention during this month should be directed towards the thorough preparation of land in order to form seed beds for the main crops. A well prepared seed bed will lessen the expense incurred in after cultivation and with better results. In the case of land ready for second ploughing, this operation should be done if possible when a good weed growth is in evidence, and by so doing (1) a further supply of humus is incorporated with the soil; (2) weeds are eliminated.

Substitute for Butter-fat in Milk.—Linseed may be grown as a substitute for butter-fat; boiled linseed mixed with separated milk forms a rich diet for calves. Amount of seed per acre, 20 lb. to 30 lb. sown broadcast.

Maize.—In the colder districts maize may be planted this month. Useful varieties:—Mid-late in maturing, Hickory King (white dent), Potchefstroom Pearl; mid-early in maturing, Natal Eight Row (yellow flint), Chester County (yellow dent), Iowa Silver Mine (white dent). Use only selected seeds with a high germinating percentage.

Beans.—Good commercial beans ready for harvesting within 90 days after planting:—Small White Haricot, Flageolette, Natal Sugar. Where the growing season will permit, and the soil is of good fertility, it is possible to harvest two bean crops of the above varieties in one season. This is a matter which should receive careful consideration with regard to crop production.

Artichokes for pigs may still be planted in October; the tubers will provide an excellent feed during the winter months.

THE AGRICULTURAL CRISIS.

An American Investigation with Applicability to South Africa.

THE chief industry of South Africa—agriculture—is in a critical condition, and while relief and buoyancy must come in the course of time, the period that intervenes and that now, perhaps, is at its lowest point, compels the utmost fortitude and care of the farmer if he is to weather it successfully. And he is aware of it. Unfortunately, the much desired removal of present conditions does not lie in any quick, decisive action that the farmer can encompass, nor, indeed, is it wholly in his hands that the remedy lies. Harassed and faced with ruin, the farmer to-day is seeking those steps that will lead him to clear water, and in his endeavours he naturally looks for guidance to those entrusted with the development of his industry. An endeavour was made to make the position clear in an article published in the March, 1922, issue of the *Journal*. It outlined, briefly, the cause of the depression, showed how it developed, and what was the farmer's part in overcoming it. It pointed out that the law of demand and supply would eventually bring that equilibrium which is conducive to prosperity, while the farmer should endeavour by every means to reduce the cost of production, which can be facilitated by co-operative buying. A sound system of co-operative marketing was needed in order to eliminate unnecessary middlemen. Above all, farmers were urged to stand united; by organization they can help on the return to equilibrium of demand and supply, for they themselves produce the essentials of life. Since that article was published, the Co-operation Act has been passed, which, together with other measures resulting from the session of Parliament just over, is destined to speed the farmer far on the road of organization and self-help.

WIDESPREAD DEPRESSION.

Help may also be obtained by studying the present day experiences of other countries. For we are not alone in this gulf of low agricultural prices: it is world wide. Periods of alternating great prosperity and succeeding great depression occur with more or less regularity among all modern nations that are organized. And it is generally accepted that the primary cause that arrests and swings back the pendulum from a period of expansion and prosperity, is the exhaustion of credit and money capital, in the wake of which comes loss of either foreign or domestic markets, or both. Few periods of prosperity have been more swiftly succeeded by one of depression than was witnessed towards the close of the war, and in the toils of which we still find ourselves. Following the unprecedented prices that mounted during this period, the commencement of the break occurred in Japan during the latter part of 1919, when occurred the fall in the

price of silk, and after which the price level in all commodities began to decline: within the next year a similar decline was seen in England, followed almost simultaneously in France, Italy, the United States, Germany, India, Canada, Sweden, Holland, and Australia. In a short space of time all four quarters of the globe were affected.

THE AMERICAN VIEW.

In the United States the great rush of descending prices touched every industry and every class of people. A Joint Commission was appointed in that country to investigate the condition of the agricultural industry as a result of the crisis that had arisen, and the first part of its report* based on exhaustive consideration of masses of data (and which is made use of in this article), is of particular interest to farmers in South Africa, for it refers to conditions that also exist here, the amelioration of which will alone bring relief to the troubles that have overtaken us.

The report describes the processes that operate during periods of prosperity and of depression, and how these periods alternate. Believing that the country is now emerging from the latter, the commission recommends various steps that will bring about renewed prosperity and greater stability in the agricultural industry, and it is in the summing up of the position in the United States that much is said that applies equally well to conditions in the Union.

On the whole, it was not considered that overproduction or overmarketing of farm products led to the decline of prices in the United States, but that the first downward impulse in prices of live stock and produce was given by the diminishing demand for export resulting from the failing purchasing power of the world. Consumption of wheat, beef, mutton, and dairy products fell off during the period of depression, and this contributed to and accelerated the decline in the prices of these commodities.

THE ROAD TO PROSPERITY.

After reviewing the trend of agriculture in the United States over a number of years, the report states that a definite programme is needed for the future with a view to relating agriculture with the various agencies of distribution in such a way as to avoid duplication, waste, and loss in the common purpose to deliver the products of the farm to the consumer in the most economical and efficient way. For this purpose a more extended and prompt system of agricultural statistics is necessary, and when it is remembered that the system already operating in the United States is the most extensive in the world, it will be realized how dependent organization is on reliable statistics and forecasts. To procure such statistics there must be a basis of standardization of agricultural products and containers (a matter sadly lacking in South Africa). Such standardization is likewise essential to any adequate scheme of marketing and distributing farm products if unnecessary waste and losses are to be avoided. Distribution will be greatly facilitated by sound and practical standards and grades applied to agricultural products in commerce.

* "The Agricultural Crisis and its Cause" (Report No. 408). Government Printing Office, Washington.

Of special interest to South Africa at this time when co-operation is on the eve of considerable extension, is the finding of the commission that there is further need for organization and co-operation, notwithstanding that there had in recent years been a marked development of farm organizations upon co-operative lines for the purpose of selling, sorting, grading, marketing, and processing farm products. Losses to the farmer, it is stated, due to his failure to properly sort, grade, and bulk his product are by no means inconsiderable. Individual farmers, however, cannot economically purchase and operate the necessary machinery and maintain the necessary agencies for this purpose. It must be done co-operatively if the farmer is to do it; otherwise (and as now obtains in South Africa), the farmer must turn this phase of the function of marketing over to some one else, who will then, instead of the farmer, reap the profits incident to the better sorting, grading, and packing of the produce.

FAR REACHING RECOMMENDATIONS.

The recommendations of the Joint Commission cover a wide field, viz., the legalization of the co-operative combination of farmers; better credit facilities; an improved warehousing system; the immediate reduction (since given effect to in certain respects) of freight rates on farm products; an extension of the statistical divisions of the Department of Agriculture; the provision of agricultural attachés in the principal foreign countries producing and consuming agricultural products; more accurate, uniform, and practical grades of agricultural products, and standards of containers for same; the promotion of better book-keeping by farmers; a programme of practical and scientific investigation by the State directed toward reducing the hazards of climate and weather conditions, and of plant and animal diseases and insect pests; more adequate facilities for handling perishables at primary markets and for distribution at the large centres; better roads to local markets; the improvement of community life.

These then are the processes that were recommended to hasten prosperity and avert the crisis in the agricultural industry of the United States, a country with great natural resources, much wealth, a hundred million people, and a highly organized and extensive Department of Agriculture. In the Union our needs are as great, but, in comparison, how few our resources? But with all their facilities, the farmers of the United States, like ours, are not able entirely to remove the present state of uneven values, for this is the final recommendation of the commission:—"The renewal of conditions of confidence and industrial as well as agricultural prosperity is dependent upon a readjustment of prices for commodities to the end that prices received for commodities will represent a fair division of the economic rewards of industry, risk, management, and investment of capital. These conditions cannot be brought about by legislative formulas, but must be the result for the most part of the interplay of economic forces."

THE FARMER'S MAINSTAY.

What then must the farmer of South Africa do at this crisis to bring the relief that he so direly needs? He has reason to call all

his courage to the fore when he views the magnitude of the task that lies before him, especially after reading the above recommendations that portray the need for greater facilities in a country which already possesses much that we have yet to attain. As in America, so in South Africa, the Government cannot wave a wand that will set in motion the various steps that bring stability. There will be many to exclaim:—"We ask for bread and are given a stone!" But whatever the Government may do, nothing worth while can be achieved without the self-help of the farmer. There is no short and royal road out of the morass of our difficulties: with patience, fortitude, mutual trust, and an intense desire to learn and improve, the farmer must press on. His mainstay and hope is co-operation, and of the true kind. Let it grow rather from small but thoroughly sound and business-like beginnings. The reward will surely follow, perhaps more speedily than at present we can hope for. If every farmer realized this, the task, indeed, would be easy and improvement of conditions marked and abiding.

There is another consideration, and it affects the town dweller perhaps more than the farmer, and that is a keener, national spirit in the consumption of the country's products. The locally produced article should come first in every case, and in perishable products such as fruit and vegetables, consumption should be stimulated The plaint of the consumer, and he has reason for it, is that fruit and vegetables, for instance, are too expensive, and that their consumption has to be reduced to the barest limits consonant with good health: on the other hand the producer suffers from an inadequate market and poor prices Here exists a condition that proper organization can remedy: co-operation again is the means of bringing producer and consumer into more direct touch than the present system offers. And so in other ways, the rock on which the farmer must found himself is that of co-operation which ensures both material and spiritual benefit. With this sure aid, and confidence in an industry that has survived other crises and has almost forgotten obstacles that at one time seemed unsurmountable, farmers, even in the most depressed districts, have prospects that few other countries can better.

Plant Nurseries in Quarantine as at 1st September, 1922.

Name.	Address.	Cause of Quarantine.	Extent of Quarantine
C. F. Marais	Wellington ...	Red Scale ...	All citrus.
Lovedale Institution...	Alice	Red Scale ...	Lemon stocks.
S. B. Bartlett... ...	Clumber	Red Scale ...	Whole Nursery (citrus).
F. N. Tarr	Bathurst	Red Scale ...	All citrus.
D. A. English & Co. ...	Pietermaritzburg	Red Scale ...	Lemon stocks.
R. Mason & Son ...	Pietermaritzburg	Red Scale ...	Lemon stocks.
T. F. Elphick... ...	Malelane... ...	Red Scale ...	Part Nursery (citrus).
Municipal Nursery ...	Potchefstroom ...	Ross Scale ...	Part Nursery (all privets).

HUBAM CLOVER
(*Melilotus alba, var. Annua*).

By H. A. MELLE, B.A. (Agr.), N.D.A., Officer in Charge, Botanical Experiment Stations, Pretoria.

THE necessity of winter feed for live stock is now recognized by most South African farmers, yet it is surprising to find how few attempt improving their native pasturage by judicious grazing and laying down permanent pastures. In other countries it is considered a fundamental part of good farming to make provision for an adequate supply of food for stock during winter months. South Africa is essentially a pastoral country, the greatest portion of it being devoted to animal husbandry, and, as a general rule, all live stock are dependent for their sustenance on the natural veld herbage. The veld during winter, in most parts of the Union, cannot keep stock in a thriving condition, and every breeder knows that stock should be kept in that condition to obtain the best results.

The Botanical Division has been investigating these problems of suitable pasture grasses for the last twelve years, and has now pure cultures under cultivation of most of the best native grasses and also exotics from different parts of the globe. Great difficulty has been experienced in finding a legume which would not only be able to adapt itself to our adverse conditions, but would also grow with grass and not become choked. Some clovers, especially English Wild White, have been found to grow very well in conjunction with Kikuyu grass. But, owing to the exorbitant price of the seed, and the moisture requirements of this clover, it can only be grown under favourable conditions and under irrigation. At last it seems that we have a plant that will answer our requirements, and that plant is Hubam clover.

DESCRIPTION.

Hubam clover (*Melilotus alba*, var. *annua*) is a variety of sweet clover (stink klawer). It makes about the same growth in one season that the ordinary sweet clovers do in two. Most of the common clovers are biennial, or two-year clovers; if seed is sown in spring the clover makes a small growth the first season, remains dormant during the winter, completes its growth, matures seed, and dies the next summer. In contrast to this, Hubam clover continues its growth until it reaches a height of from 3-8 feet within 3-7 months from the time the seed is planted, matures its seed, and dies, all within the one season.

The following description of Hubam clover is taken from an article by Mr. W. S. Hall on the subject, which appeared in this *Journal*, November, 1921 (page 463):—

"It is an herbaceous plant, with trifoliate leaves; the flowers are disposed in long-stalked, loose racemes growing from the bases of the leaves, and are white in colour; the seed-pods are marked with irregularly netted veins, and each contains one seed. In the early stages growth is slow, but subsequently firm stems are formed and a

height of from 4-8 ft. attained. It flowers irregularly over a period of at least two months . . . ; in the later stages the lower stems are somewhat woody. The plant has a pleasant odour, resembling Tonquin beans. It has a well-developed root-system, which penetrates deeply into the soil, loosening it, and providing favourable conditions for succeeding crops. After seeding, the plant dies.

"It resembles the biennial form of melilotus in appearance; the annual has a smaller, more woody root; and crown or resting buds are *not formed*. The stems, branches, flowers, pods, and seed are indistinguishable from the biennial form, but during the season of seeding the annual grows more rapidly, blossoms, fruits, and dies.

"In the case of the biennial, the slender stem of the first season's growth dies and is represented by a stub of dead tissue.

"Around the stub, and coming from the crown, two or more strong branches form in the second year (the growth from the resting buds); such branches *never occur* in the annual form. The seed of the annual cannot be distinguished from that of the biennial form."

ORIGIN.

A few plants were found by Professor Hughes in greenhouses at the Iowa Experiment Station in the winter of 1915-16 among biennial white clover plants being tested from various parts of the United States. Its probable point of origin was determined to be a limestone ridge in Alabama. There Professor Hughes found it growing wild, crowding out weeds, and over a considerable acreage being cultivated and cut for hay.

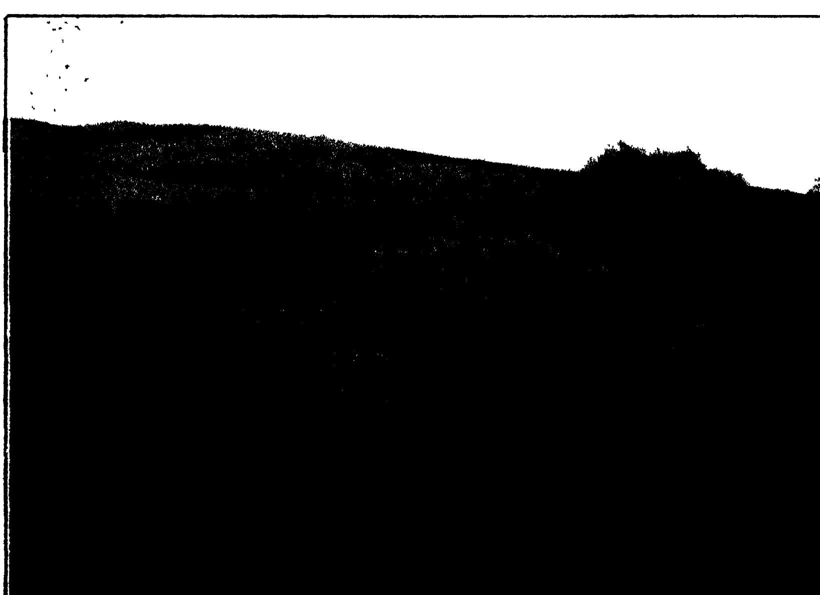
USES.

Although Hubam clover can be used for several purposes, its best use is that of a pasture renovator and soil builder. Owing to its vigorous growth, it is an ideal plant for green manuring. It is reported that a seeding of Hubam made in New York put on a growth of 9 ft. in 3 months and 16 days. At the Groenkloof Botanical Station within 3½ months it grew to 7 ft.-7 ft. 6 in. Here, too, it has proved to grow very well with established Kikuyu grass. Plate 1 shows Hubam clover growing with Kikuyu. It not only renovates the Kikuyu, but supports the slender stems of the Kikuyu. In some places the Kikuyu attained a height of over 3 ft. when growing with Hubam.

It commences growth much earlier than Kikuyu. At the time of writing—first week in August—Hubam from self-sown seed is showing about 3 inches above the Kikuyu. It is apparently an excellent pasture-renovator. Kikuyu, after the third year it is established, becomes sod-bound, but when grown with Hubam it does not "go off" as when grown by itself. Hubam, through the agency of its deep-growing root-system, prevents the Kikuyu becoming sod-bound, and, being a legume, keeps the grass well supplied with nitrogen. The *Rural New Yorker* states: "Inside of 100 days annual white sweet clover will bring to the soil and distribute as much nitrogen as a farmer can hope to get from fifteen loads of manure to the acre. . . . We have never seen any legume grow as fast as this does."

It cannot be recommended as a hay-plant; it has coarse woody stems and the leaves drop off before the rest of the plant is fit to be stocked.

Hubam Clover, growing in Kikuyu.



Hubam Clover. Sown April, 1922. Photographed 3rd August, 1922. Commenced flowering in June, and flowers can still (August) be noticed.

As a pasture it can be strongly recommended, as it commences to grow early in the season and remains green, and, if sown late, throughout the winter. When once stock acquire the taste for it they eat it readily. The chief objection to it as a pasture plant is that it becomes very coarse unless grazed down, but, if grown under irrigation, it affords a good bite for stock from about August and is eaten greedily.

In America, Hubam is regarded as one of the best bee plants ever grown.* Progressive beekeepers consider Hubam clover the greatest of all honey-producing plants. This is because of its richness in nectar and its long blooming period that, in most regions, comes when the main honey flow is past. A beekeeper who has his apiary located on Hubam clover fields reports that "my stronger colonies are each producing one super of finest honey per week."

DROUGHT AND FROST RESISTANCE.

As yet we have not tested the drought-resistant qualities of Hubam. In America it is considered remarkably drought resistant.* "In one instance, without irrigation and with less than one inch of rainfall after the clover was seeded, it grew to a height of 7 feet, and showed no ill effect of the drought when other vegetation perished in the worst drought experienced since 1882."

At Groenkloof, this season, Hubam has shown itself to be more frost-resistant than barley. A plot was sown in April last. In June it attained a height of 3 ft. 6 in., and commenced flowering. It was still green in August, and only a few stems have become affected by frost. It has continued to flower since June.

A plot was seeded in May and another in June. In both these plots the seeds germinated and grew about an inch, and then stopped growing. In August they again showed signs of growth.

PREPARATION OF THE SEED-BED AND SEEDING.

The seed-bed should be prepared in a manner similar to the seed-bed for any other standard farm crop. It should be planted on a firm seed-bed with a surface mulch of loose soil.

The seed-bed should not be planted deep—just covered with soil is best; in fact very similar to sowing lucerne. If required for seed, the best time to sow is in the spring with the first summer rains. But if intended for winter grazing, sow late in February or early March.

SOIL REQUIREMENTS.

Hubam clover is said to thrive wherever other clovers grow, and may be made to grow well on soils not naturally adapted to it by the application of lime and proper inoculation. Being a legume, it is naturally a lime-loving plant, and will not grow on a sour soil, but grows best on a soil having a good supply of limestone. The bacteria found on the roots of a leguminous plant will not develop and thrive in a sour soil. To get the best results the soil should either be previously inoculated, i.e. on soils where "stink klawer" (*melilotus officinalis*) grows naturally, or the soil can be artificially inoculated. A satisfactory way of introducing the necessary bacteria is to use the soil obtained from around the roots of sweet clover plants (stink

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* Hubam Clover: The A. I. Root Comp.

klawer) that are known to be inoculated. To ascertain whether a crop of sweet clover is inoculated, dig up the plants and carefully wash off the ground adhering to the roots. If the plant is inoculated, wart-like excrescences will be found attached to the roots of the plant. This soil should be pulverized thoroughly, dried carefully by exposure to the air, and sifted. It may then be sprinkled over the sweet clover seed which has first been slightly moistened with glue-water (1 teaspoonful of pulverized glue to a pint of water); 1 pint of this mixture will treat from 1-2 bushels of sweet clover seed. If not seeded at once, spread it in a thin layer to dry. The bacteria are said to live only about a week on the seed after inoculation, and, if in the sunshine, only a few hours, hence the necessity of sowing soon after treating the seed.

QUANTITY OF SEED PER ACRE.

In America, Hubam clover is grown either in cultivated rows or broadcast with or without a nurse crop, or with any of the small grains, as is the custom of seeding the common clovers. In cultivated rows, 3 feet apart, 3-4 lb. per acre are generally sown to ensure a good stand and, at the same time, allow loose cultivating. If sown broadcast, 10-15 lb. of seed per acre are sufficient; for green manuring a thicker sowing is advisable, about 20 lb. per acre.

TIME TO CUT.

It it is desired to be cut for hay, and only one crop is to be harvested, it may be left until it reaches its maximum growth. When two or more crops are to be harvested, the first crop should be cut when the plants have made an average growth of 30 inches. The crop should be cut for hay before the plants bloom and the leaves begin to shatter.

The crop is more difficult to cure than lucerne, and the leaves are likely to shatter before the stems are cured. For this reason it is very unlikely that Hubam clover will be exclusively used as a hay-crop.

If it is desired to raise seed, Hubam should be harvested when the seed-pods are turning brown. Anything from 5-10 bushels of seed can be expected from an acre.

SUMMARY.

Hubam clover can be regarded as a rival to cowpeas, as it very largely fulfils the same function as the latter crop.

1. Owing to its upright growth it would be very much easier to cultivate and reap than cowpeas.

2. It puts on far more foliage in a season's growth than cowpeas, and for this reason may be more valuable as a green manure.

3. In places like Natal, where cowpeas are badly attacked by rust, Hubam clover may wholly replace it as it is not only drought-resistant, but thrives in plenty of moisture.

4. According to reports it is one of the most drought-resisting plants under cultivation, and at this station it has proved itself to be more frost-resistant than lucerne and the common clovers.

5. As a bee-plant it is unequalled. By sowing at different times of the year at the Botanical Station, Pretoria, we have had Hubam flowering throughout the year.

THE LIFE-HISTORY OF THE WIRE-WORM OF SHEEP.

REVIEW BY THE DIVISION OF VETERINARY EDUCATION AND RESEARCH.

Introduction.—The wireworm of ruminants, scientifically known as *Haemonchus contortus,* is a small thin worm which passes part of its life in the "fourth stomach" or "abomasum" of sheep, cattle, goats, and other ruminants, including wild game such as buck. Its distinguishing scientific name *contortus* is given to it on account of the contorted or spiral appearance of the internal organs of the female. In the adult form the white ovaries of the female are rolled round the reddish intestine to form regular loops, and this gives it a spiral striping like a barber's pole. It lives by sucking blood from the "mucous membrane" or lining of the stomach, and from this blood its intestines derive their colour.

Post-mortem examination of an infected sheep shows the presence of the adult worms, rather over an inch in length and about as thick as an ordinary sewing-needle. They are found either wriggling about in the stomach (abomasum) or in clusters round the stomach walls.

The general symptoms of acute wire-worm infection are inflammation of the stomach and "anaemia," i.e. an impoverished condition of the blood. This shows itself externally as a paleness of the mucous membranes of the mouth and eyes, loss of flesh and general weakness, accompanied by thirst and diarrhoea, and sometimes by a dropsical effusion (or watery swelling) under the jaw.

Lambs and young sheep are most seriously affected, but although fully-grown sheep also suffer, they can sometimes harbour the worms for a long time without showing serious symptoms, provided the veld is in good condition and they obtain abundance of good food. Such *apparently healthy* adult sheep are a serious source of danger, since they keep the infection alive and, in their droppings, scatter eggs to infect the veld, and hence infect the rest of the flock.

There are six stages in the life-history of the worm—the egg, four "larval" or immature stages, and the adult. Half of these stages is passed in the stomach of the sheep and the other half outside on the veld. The complete life-cycle may be indicated as follows:—

Adults.—Fully-grown males and females only live in the fourth stomach of sheep or other ruminants. Here they may thrive all the year round, although the degree of infestation depends upon the season. Once a sheep is infected with wire-worms it may remain infected for a very long time unless measures are taken to eradicate the parasite.

The female is somewhat larger than the male, and is readily distinguished by the enlargement over the hind third of its length, corresponding to the egg-laying organs. When full size has been reached, the average length is about one inch and the average breadth about one-fiftieth part of an inch. The females are then fertilized by the males and egg-laying begins.

Eggs.—The eggs then leave the stomach along with the food, pass through the intestines, and out with the droppings or "faeces." The

eggs are oval in shape and very small; only about one four-hundredth part of an inch in length. The number which can be passed out by a badly infected sheep is enormous, and even an infected sheep which is still *outwardly healthy* in appearance may pass as many as three million per day. The eggs then hatch out in the droppings on the veld, provided conditions of temperature and moisture are suitable. The warm wet weather of summer is most favourable, and hence spread of wireworm infection is worst at this season. Hatching is very rapid and may begin at once, since development of the eggs occurs even in passing through the intestines. Under favourable conditions, eggs may hatch 19 hours after being laid.

First Larval Stage.—When hatching occurs, a small thread-like "larva" (immature developmental stage), about one-eightieth part of an inch in length, crawls out. This larva feeds on the manure in which it hatched, grows a little, forms a new skin, then moults or casts the old skin, and emerges as the second larval stage The first larval stage is passed through in about one day.

Second Larval Stage.—At this stage, the worm is about one-fiftieth of an inch in length, is very lively and continues to feed on the droppings of the sheep. It then grows another skin, partially detaches the old skin while developing towards the third larval stage, and in this "ensheathed form" is called the "mature larva." The whole process takes less than two days, and the mature larval stage may therefore be reached about three days after hatching, provided conditions of warmth and moisture are favourable. It is in this stage that the worm is *infective*. Neither the egg nor the first larva can infect an animal, but at the mature larval stage the tiny worm proceeds to find a "host," i.e. a sheep or other ruminant, in which to complete its development. At this stage it is about one-thirtieth of an inch in length, can live for a long time, and is migratory in habit. It leaves the medium (dung of the sheep) in which it developed, and travels up the damp blades of grass. In eating the grass the sheep takes the matured larvae into the stomach, and in this way becomes infected.

Third Larval Stage.—The worm now commences the parasitic part of its life (first parasitic stage), casts its detached skin (remaining from the second stage), continues its evolution, forms a third skin, moults again, and emerges as the fourth larval stage.

Fourth Larval Stage.—At this "fourth larval" or "second parasitic" stage, the worm commences to bore into the surface of the stomach, causing a slight effusion of blood. Within the blood clot so formed, the larval worm is found. Growth continues, and a length of about one-fifth of an inch is reached in rather over a week, while at the same time differentiation of the sexes occurs. Male and female worms can then be distinguished. A fourth skin forms, is duly cast, and the young adult worms appear; the whole process being completed about a fortnight from the time the mature infective larvae entered the stomach.

Adult Stage.—This third parasitic or last stage of growth is completed in about another fortnight, during which time the worms grow from about a quarter of an inch in length to full size of one inch, and become sexually mature. Fertilization then takes place,

and the female begins to lay eggs, so completing the life-cycle of the worm.

Summary.—There are thus three non-parasitic stages, i.e. the egg, the first larva, and the second larva, passed outside on the veld; and three parasitic stages, i.e., the third larva, fourth larva, and adult (male and female), passed in the stomach of the sheep The time from entrance of the mature larva into the stomach until the first laying of eggs, is about one month, and consideration of this period is, therefore, of the utmost importance in any system of dosing. If wire-worm infection is to be eradicated with certainty, dosing must be repeated at least once a month in order to prevent females from developing to the stage at which they can lay eggs and so perpetuate the infection. If they do manage to lay eggs, these hatch out on the veld, develop, promptly re-infect the sheep, and restore the vicious cycle.

Influence of Season.—Since moisture and warmth are necessary for development of the eggs and early larval stages, veld infection is greatest during the warm wet periods of the year. The infective larval stage may be reached in three days in warm weather, but only in three weeks in cold weather; and not be reached at all in frosty weather. A reduced infection of the veld may however prevail all the year round, especially in vleis, since the mature larva in its "sheathed form," and with its capacity for "migrating" or wandering along moist surfaces, will live for a long time. Exposure to direct sunlight and drought will kill it, but under such adverse conditions, it returns to the soil to hide, only coming out again to crawl up the grass in dull damp weather. If, of course, the worms never find a "host," i.e. sheep or other ruminant, they finally die a natural death. The two practical points to remember are:—

(1) That an infected pasture may remain infected for at least a year, and that all sheep grazing on it during this time are liable to become infected.

(2) That a living sheep spreads the infection so long as adult wireworms are present in the stomach.

Eradication of the Worms.—In order to suppress the wireworm plague, it is therefore necessary to kill the wireworms in the stomach of the sheep and to clear the farm of mature larvae. The first task can be accomplished by using the Wire Worm Remedy supplied by the Division of Veterinary Education and Research. The second is more difficult and takes longer to accomplish. One method would of course be to keep away all animals which act as hosts (sheep, goats, cattle, buck), for at least a year, and so leave the larvae to die a natural death; but this method is not feasible in ordinary farming. The other method is to allow the sheep to pick up the larvae in grazing, but to kill them off in the stomach before they reach the egg-laying stage. Since the parasitic worm takes from three weeks to a month to reach sexual maturity, the treatment involves regular dosing at least once a month, especially during the rainy season. If this is done, no eggs are laid, no fresh infection of the veld occurs, and the larvae which are not picked up by the sheep die in time. The farm is then clean and, provided no further infection is brought in from other areas, dosing is no longer necessary. Although the possibility exists that the infection may be kept alive by ruminants other than the sheep (cattle,

buck), experience has shown that these animals are only rarely infected, and hence systematic dosing of sheep and goats is generally sufficient to eradicate the infection. In the rare cases in which infected buck, with which dosing is impossible, do keep the infection alive, periodic dosing of the sheep and goats may have to be continued indefinitely. It must be remembered that the Wire-Worm Remedy is a cure and not a preventive. It kills the worms in the stomach, but of course passes out of the stomach with the food, and hence cannot prevent reinfection. There is, therefore, no practical way of preventing reproduction of the worms except by killing them off regularly once a month until the source of infection on the veld itself disappears.

It may be added that the directions for use of the Government Remedy are arranged to eradicate worms as completely and quickly as possible, without danger of poisoning the sheep. They are therefore more drastic than most remedies upon the market, especially in regard to preliminary starvation treatment. Even if used under the less drastic conditions advertised for other remedies, however, the Government Remedy is as effective as any of them.

Analogy with Tick Eradication.—The principle underlying these recommendations will perhaps be clearer if it is compared with the principle of eradication of ticks. Ticks cannot be prevented from attaching themselves to stock, and cannot be killed out in the grass by any feasible method. The stock therefore collect the ticks, but if the stock are regularly dipped the collected ticks are either destroyed, or do not lay fertile eggs, and hence do not perpetuate the infestation. The ticks which do not attach themselves to stock die a natural death in course of time, and hence after a year or two of regular dipping, the farm becomes clean. In the same way, the sheep collect the wireworm larvae, and the dosing destroys them. In the case of ticks, short intervals between dippings, three to fourteen days according to the kind of tick, are necessary because the ticks breed very quickly after attaching. In the case of wire-worms an interval of three to four weeks between dosings is sufficient to prevent breeding. If the dosing is systematically carried out, the wire-worms will be rapidly reduced to negligible numbers, just as ticks are reduced by dipping.

Diagnosis by Means of Culture.—A practical and easy method of finding out the extent to which sheep are infected with wire-worms, even before they show the ill effects of the infection, is to cultivate the eggs from the droppings and observe the migrating larvae. Every farmer can do this for himself by simply collecting fresh moist droppings from the suspected sheep, placing them in a glass jam-jar, placing the jar in a comfortably warm cupboard, and watching events from day to day. Provided the droppings have been sufficiently moist, a fine dew deposits on the sides of the glass, and from the fourth day onwards the larvae, which have developed from the eggs passed out by the sheep in the droppings, begin to migrate and form slimy white tracts ramifying over the surface of the glass. If the glass is now exposed to strong light the larvae will be observed to return to the droppings, and enter them again provided they are still sufficiently wet. It should be added that "sour faeces" are unsuitable for culture, but that in most cases the experiment is successful, instructive, and useful.

SHEEP BREEDING FOR EXPORT.

By O. RIVERS, Officer in Charge of Sheep, School of Agriculture, Potchefstroom.

PIONEER DIFFICULTIES.

IT is a matter of common history, perhaps not so well known in South Africa as in Australia, that the difficulties encountered by the pioneers in the export of frozen meat were almost insurmountable. Cargo after cargo was condemned on arrival in England. These had to be destroyed and turned into manure, while the consignors were the losers, for in those days (forty years ago) the insurance companies would not insure for sound delivery, and, in addition, the methods of successful freezing had not reached the state of perfection they have to-day.

In spite of all the losses incurred, which must have amounted to hundreds of thousands of pounds, the pioneers of this great industry "carried on" until they overcame the obstacles which caused such losses of time and money, and finally banished the natural prejudice against imported meat from the minds of the British public. For at least twenty years after mutton was first exported from Australia to England, the highest wholesale price per pound obtained on the London market was not 4d., but averaged from 2¾d. to 3¼d. When the expenses entailed in railage, slaughtering, handling, freezing, shipping, insurance, and commission were deducted, frequently a serious loss to the companies resulted. This, however, did not in any way deter the pioneers from carrying out their intentions to a successful issue. This is indeed something to be proud of, as little or no assistance was given by the Governments of those days.

These hardships are not now to be met, for in South Africa we can, at any rate, rely on the assistance of the Government, who will encourage us in following the example of those who have built up their large industry.

At the time the meat export trade was commenced, Australia was in a somewhat similar position to what South Africa is in at the present time: there was a large surplus of sheep and a market had to be found. The sheep were mostly of the Merino type, while a very large percentage of these were long-legged and light-bodied. These as a rule did not easily fatten, and when fat the best only scaled fifty pounds, dressed weight. In order to improve this type of sheep, and obtain a carcass averaging from fifty-six to sixty lb. in weight in half the time, many Australian farmers introduced extensive cross-breeding on the surplus Merino ewes; the sires used were mostly of the long-woolled English breeds. The country could well carry the heavily-woolled cross-bred thus obtained, and these sheep gave the required carcass at an early age, and a valuable fleece of wool. At from two to three years old they were fit for export, and were worth more money than the Merino at five years.

Farmers were at their wits' end to know how to dispose of their surplus sheep. In many cases the carcasses were boiled down for the fat, while the meat, bones, and offal were turned into manure

to make room for the young stock coming on. Butchers were paying such low prices for mutton that to boil down the carcasses gave equally good returns. At that time the whole profit of sheep-raising was derived from the wool, but this did not then average anything near 1s. per lb. Good prices were obtained only for superior Merino and fine cross-bred wool, the best of which realized from 1s. to 1s. 2d. per lb. for many years.

THE RISE OF THE EXPORT TRADE.

After the export trade had been carried on for a few years, the types of sheep bred had incidentally become much superior to what they had been previously. The demand for a heavier carcass than the Merino gave was soon met by the system of cross-breeding on the Merino ewe, and the improvement thus obtained resulted in better prices for the exported meat. Export not only got rid of surplus stock, but also gave every opportunity and encouragement for breeding better sheep, as year by year more grazing was available for the young and improved increase. At the same time another most important change was an improved and a stable local market, which is still in existence.

Any country can rightly be proud of the colossal strides this trade has made during the past twenty years, and South Africa could do equally well if her farmers would try to emulate the Australians and organize their breeding to suit the world's markets.

South Africa has, according to the latest statistics, more than one-third the number of sheep of Australia and New Zealand combined, over five millions of which are Persians, bastards, and nondescripts. The 1919 census gives 34,101,303 as the total number of sheep in South Africa; in 1920 it is stated that nearly three and a half million of them died during the drought of 1919-20—thus leaving, with the increase for 1920-21, approximately 35,000,000 sheep on hand.

To work up the export trade, the Persians, bastards, and nondescripts should be principally dealt with, leaving the other breeds of sheep to supply the better classes of wool.

In advocating the use of Merino ewes for cross-breeding in South Africa, it is not intended to convey the meaning that cross-breds should in any way supersede Merinos, but rather the reverse, as Merino ewes that are cast for age and culls of an undesirable type could be profitably made use of to produce an early maturing carcass of lamb or mutton. The Merino in South Africa is one of our most valuable assets, and when possible profitably to grow them it would be folly to replace them with cross-breds of any kind, as the world's supply of Merino sheep has never been as low for many years as it is at the present time, and in spite of the accumulation of wool, owing to war conditions, the greater part comprising inferior grade Merino and cross-bred wool, the outlook for Merino wool is decidedly bright and likely to last for many years to come.

The latest figures (March, 1921) as given by the *Pastoral Review* of Sydney, New South Wales, show the enormous trade now done in frozen mutton by Australia and New Zealand. The total number of sheep in Australia in 1920 was 75,186,058, and their export to the United Kingdom 3,571,534 sheep and 1,917,119 lambs. This is considerably below the average, owing to a bad season and drought in the early part of the year. New Zealand had in 1920 a total of

23,914,506 sheep and exported to the United Kingdom 4,676,575 sheep and 2,031,473 lambs, and in addition to other countries, principally to the United States of America, 382,862 sheep and 2,422,773 lambs, making a grand total from Australia and New Zealand of 15,002,336 sheep and lambs exported during 1920, which represents roughly at least 15 per cent. of their total sheep. There is no wonder that these countries are forging ahead.

The class of sheep that finds most favour and commands top prices are those weighing from 56 to 64 lb. fat; heavier weights do not bring the same price per pound, as they are not so suitable for family trade. In lambs, the best weights are from 36 to 42 lb.; over the latter weight they sell at quite a penny a pound less. The same applies to sheep; a 64-lb. hamel will sell for as much as one weighing 74 lb., and it is easier to produce the lighter weights and sell at an earlier age.

LOST OPPORTUNITIES.

The start that South Africa made during the war to export mutton has apparently proved unsuccessful. According to our trade returns for 1919 we exported beef to the value of £1,073,436 and mutton £1706, while in 1920 beef had fallen off to £304,073 and mutton to £7. These figures speak for themselves and give food for reflection when compared with those of other countries, which are forging ahead and finding a market for all the stock they can raise.

South Africa has many advantages not possessed by Australia; it is three weeks nearer the world's markets, freights are lower, and we can supplement the supply of lambs for the market when theirs are not fit, or their export has finished for the season. Our sheep farmers will soon have a large surplus of stock and a rapidly falling market, with no outlet beyond home consumption. They will have to improve their breeds of sheep in order to claim a place in the world's markets. This can only be brought about by the introduction of cross-breeding on the right lines, and by a better system of management and marketing.

The past few years should have seen all this accomplished if farmers had been alive to their own interests, but so far they have not even made an attempt to breed the right sort of sheep for the export trade. And during the past ten years there has been a steady increase in the number of sheep in South Africa, totalling about seven millions or more, and if this continues it is obviously going to force the position very soon.

The few sheep of the desired type that were exported during the war were most favourably commented on by the best men in the meat trade in England, who said: "We can do with any number of similar sheep and lambs." Now, when sheep have fallen in value locally from fifty to sixty per cent., we have none to export, which shows how little alive the farmers have been to their own interests.

THE REMEDY SUGGESTED.

It may be said that it is easy to find fault, but not so easy to find a remedy that everybody can carry out; so a few suggestions as to what to do may be acceptable.

It will be admitted that there is a great deal of country in the Union that is not fit to grow good, heavy-woolled sheep. It will

support Persians, bastards, other nondescripts and their crosses, all of which are not worried by grass seeds. This country is mostly situated in the drier parts, and is already being used more or less for these breeds; in many cases considering the amount of care and attention given them, they repay their owners, but they are not the class of sheep that will command the respect of the European consumers, for they are not evenly balanced mutton. They have too much fat on the rump and too little meat on the shoulder. For constitution, hardiness, resistance to disease, and fattening qualities they are, when well managed, all that can be desired; and as female stock, used as a foundation for cross-breeding for the export trade, they are invaluable. When crossed judiciously, their progeny retain all of their dams' good qualities, and have in addition the improved frame and evenly balanced fat and lean that is so essential in sheep for the European markets. These cross-breds mature earlier, and are in this respect a great improvement on their dams.

Excellent results have been obtained by crossing Suffolk rams with Blackhead Persian ewes. With cross-bred Persian and bastards, the ram also exercises a marked influence on the progeny in producing a very evenly balanced carcass, the fat is evenly distributed, a good shoulder, and, even in first crosses, a much improved leg of mutton. This is improved even more and more as further grades from Suffolk rams are obtained.

First crosses carry a light fleece of black wool averaging about 1½ to 2 lb. at a year's growth. Second crosses are a bigger improvement, both in frame and wool. They are comparatively bare-bellied, with no wool on the head or points, and they will thrive and keep fat where Merinos or other heavily-woolled sheep only keep alive. Grass seeds are the principal cause of these latter sheep not doing well, as they penetrate the skin and flesh and irritate the sheep for months, which results in general unthriftiness.

The resistance of the cross-bred to the evil effects of the bont-legged tick is also a very valuable point. One must not think that the ticks will not attack them, but these crosses appear to resist the poisonous effect of their bite better than any Merino or other woolled sheep, and consequently they can be used on tick-infested veld as an agent for picking up these parasites and so cleaning the land. They will stand very frequent dipping and, like cattle, appear to thrive all the better for it. In fact, they can be dipped at intervals of three weeks during the whole time the tick is troublesome, with good results, and, even the wool, although discoloured, is in no other way injured.

EXPERIMENTS IN CROSS-BREEDING.

Experimental work has been carried on for some years past at Potchefstroom, and the results to date have been so satisfactory as to warrant the recommendation of this cross to the farmer as a good paying proposition. In this respect readers are referred to the following articles appearing in the Department's *Journal*, viz.:—"Lamb Fattening," August, 1920; "Breeding Sheep for the Export Trade," December, 1920.

The experimental work carried on with the Suffolk-Persian crosses during September, 1920, to April, 1921, was on different lines from that carried out in previous years, but not quite on the most rigid lines possible, as will be seen later on. The ewes used consisted

of 26 Blackhead Persians, 40 first-cross Suffolk-Persians, 25 third and fourth cross Suffolk-Persians, 23 Suffolk-Merino cross; total, 114. All of these ewes were mated with two Suffolk rams, and were due to lamb from 12th August to 10th October. They were kept on veld at Brakspruit Farm, seven miles from the Experimental Farm, until the 7th August, when, owing to the severe winter and shortage of feed, they were shifted in to the Experimental Farm to lamb. It will be noticed that this lambing was due before there was any possible chance of spring feed being available on the veld. The ewes were put on growing oats to lamb, but feed was very scarce before they finished, which set back the older lambs very considerably.

A very good percentage of lambs was dropped: 129 from the 114 ewes, and 12 ewes proved not in lamb.

On 14th October they were put on the veld which had just begun to show green, and on the 26th October they were moved back to Brakspruit on to the thorn bush veld, and kept there all the summer until the final weights were taken on 4th April, 1921.

At the beginning of November the bont-legged ticks began to give trouble and continued to do so until early in March, with the result that the lambs had to be well looked after and hand-dressed. Where the ticks were was smeared with tick grease. Stockholm tar and linseed oil was found useful, but Cooper's tick grease, as used for smearing cattle, gave far better results, and is all that can be desired.

Dipping was done six times between 25th October and 4th April, at intervals of about four weeks, which helped to keep down the ticks to a certain extent. The fact that the sheep had to travel backwards and forwards seven miles each way was, of course, not likely to improve their condition.

The veld they were running or was very badly infested with bont-legged ticks, more so than the average farm, and the sheep were used partly as scavengers with a view to reducing the number of ticks. These conditions cannot by any means be called ideal, all of which proves the value and hardiness of the cross-bred.

From the time the lambs were dropped, until they were two months old, they had at alternate weekly intervals a salt lick comprised of one part Cooper's powder to forty parts salt supplied to them. After the age of two months and at intervals of four weeks all the lambs were dosed once with the laboratory wire-worm powder, which effectually kept worms at a minimum and thereby very much assisted in the final results as regards the condition and health of the animals.

On 9th November all the lambs, before being shorn, were weighed for the first time at the average age of about two months.

TABLE OF DATES AND WEIGHTS.

9th November, 1920.	16th Dec., 1920	19th Jan., 1921.	16th Feb., 1921.	4th April, 1921.
Age: nine weeks ...	14½ weeks old	19½ weeks old	23½ weeks old	27 weeks old
First Cross: 38 lb. ...	52 lb.	62 lb.	68 lb.	80 lb.
Second Cross: 40½ lb. ...	56½ lb.	63½ lb.	70½ lb.	85 lb.
Third, Fourth, and Merino Crosses	Later dropped lambs unweighed at the start of experiment			77 lb.

It will be noticed that the second crosses gave the best results on paper. The average age of the first crosses as compared with the second crosses was not quite equal as they were born on the average a little later. This also applies to the third, fourth, and Merino crosses, which were mostly dropped towards the end of the lambing. The Merino crosses suffered much more from the ticks than the other lambs did, consequently it assisted in retarding their growth, and their average weights suffered accordingly.

Altogether ten lambs died during the 27 weeks, mostly from being lost in the thick bushes, when they were heavily struck by the ticks; at least half had Merino blood in them. A few of the third and fourth crosses died mostly from the effects of dipping and from being debilitated from tick poisoning. Out of 129 lambs dropped 119 were successfully reared, and, as their weights show, on the 4th of April they were fat and fit for the export trade.

On the 20th April 27 hamel lambs of all grades and 37 mixed hamels and ewes, ranging from 18 months to 5 years of age, were sold to a local butcher. The price paid was 25s. 6d. per head all round, which was equal to sixpence per lb. carcass weight, prices on the market being comparatively low. The purchaser gave the following favourable report:—

"I feel confident that you will be interested in the sheep and lambs I bought from the Experimental Farm. The whole lot killed out very well indeed, there being in a few instances a little too much fat to suit some of my customers, but the fat was nicely distributed all over the carcass, and not, as found in many types of Africander, only on the hindquarters and tail. They were also nicely proportioned, it being possible to cut nice rib-chops or cutlets right up to the shoulder-blade. The first cross seemed to carry most fat; two hamels of this cross dressed 103 and 93 lb. and only six-tooth age.

"The average dressed weight of the lambs (although I did not keep any exceptional figures) worked out at 40 lb. and the sheep, although all were not weighed, 64 lb.

"I may state that the average South African hamel works out at about 44 lb., and butchers in general do not like sheep to average more than 50 lb., this weight being the most suitable for family joints. As the lambs averaged 40 lb., it would seem to be profitable and possible for the farmer to market them at 50 lb. at from nine months to a year old and get a profitable return for his labour and outlay."

FUTURE METHODS.

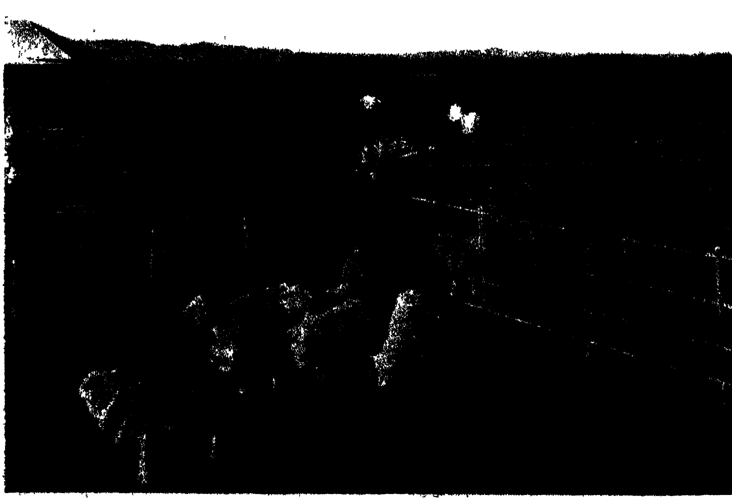
South Africa, with her 35,000,000 sheep, has at the present time far more sheep per head of population than Australia had forty years ago, and still she exports none. This position shows clearly that something is wrong with our methods, or that the country is not suitable for sheep raising. The latter cannot for a moment be admitted, and the only conclusion one can arrive at is that our management has been far from perfect, and if we do not improve our methods, the result will be a continued decline in prices until it will be no longer profitable to raise sheep. This position is rapidly coming about now, and the only way to stop it is to breed sheep suitable for the export trade.

Present-day prices, which are considered low, are not really so; in fact, they are very high considering the number of sheep we have

per head of population. Sheep could never keep at the price they are, if it were not for the enormous profits which are made by the people who handle them after they leave the hands of the growers. They really are the cause of the prices which exist to-day. As the number of sheep increases, gradually will the price obtained by the farmer decline, without in any great degree decreasing the profits of the middleman. This state of affairs should surely make the farmer think seriously and adopt better breeds of sheep, management, and means of distribution.

Arguments will be brought forward that rams are not procurable. This can very easily be rectified if farmers will meet and arrange to get them in bulk from England. The price will not be prohibitive, as it will not be necessary to buy high-class stud rams. No doubt there are many thousands that are suitable for our requirements that could be purchased at very reasonable figures.

Once this line of cross-breeding is adopted, there will be men who will see that it is profitable to breed rams locally, and so benefit themselves and others requiring them. In this way there will spring up such a change in our methods and in our sheep that we shall take a foremost place in the world's markets, thereby resulting in the stabilizing of our local market and the means of unlimited expansion in the sheep industry.



Tasmanian Sheep-Grading Pens.—School of Agriculture, Glen, Orange Free State.

THE CONTROL OF RED SCALE IN PEAR ORCHARDS.

Spray Experiments at Elsenburg during the 1920-1921 and 1921-1922 Fruit Seasons.

By F. W. PETTEY, B.A., Ph.D., Entomologist, Elsenburg School of Agriculture.

RED scale, *Chrysomphalus aurantii*, infests not only some varieties of pears and apples, but also many species of wild and cultivated plants, particularly oranges, lemons, roses, grapes (generally only when growing in the shade), oak, willow, and olive. Fruit growers should determine which varieties in their orchards require treatment for the pest. In the Elsenburg orchard, the Louise Bonne, Duchesse, Forelle, Kieffer, Comice, and Beurré Hardy pear varieties are the most attacked, and Williams, Winter Nelis, Bosc, and Bergamotte varieties are the least infested. The fruit grower should avoid, when possible, planting his pear and apple orchard near oak or willow trees, as they may be a source of infestation to the fruit trees.

The Life-history (1).—The scales are brownish in colour. The adult female is about the size of an ordinary pin-head and circular in shape. The adult male scale is somewhat smaller and elliptical. The actual scale is not the insect, but its two shed skeletons, which remain over its back in the course of its development. The partly to full-grown scale insect remains on the twigs and buds of the fruit trees during the winter. No eggs are laid, the young being born alive during the late spring and summer. They are minute, yellow, and appear like granules of sulphur. They may be seen crawling along very slowly on twigs, leaves, and fruit infested with this scale insect, moving no faster than a few inches per hour. They become stationary in a few hours to two days, do not move for the rest of their life, and then the scale, composed finally of secretions from the body of the insect, and parts of the two shed skeletons, forms on their backs. They become adults in 2½ to 3½ months. It has been noted at Elsenburg that young scale insects from individuals which may have escaped the winter spray have a decided tendency to migrate to the fruit. It appears that the fruit of susceptible pear varieties which blossom late escapes a considerable number of the migrating young. The presence of these insects on the fruit is objectionable, because it deforms and disfigures, and prevents the export of the fruit. It is clearly seen that this insect, which is minute, inconspicuous, and is protected by a hard covering, penetrable with difficulty, requires thorough spraying with high pressure to be satisfactorily controlled. It is necessary to cover all parts of the tree, spraying from all sides the buds, twigs, and large branches.

Experiments have been undertaken and will be continued to determine (*a*) whether a cheaper spray than miscible oil may be used for the control of red scale, (*b*) if one dormant spray application of a concentrated lime-sulphur mixture will control red scale, (*c*) if foliage applications of concentrated lime-sulphur, diluted to approximately 1 degree Beaumé, which are much cheaper than Bordeaux, may be used to advantage as a combination spray for the control of red scale, mites, and fusicladium. The general purpose of these experiments is to ascertain if it may be possible for the fruit grower to lessen considerably the expense of producing a crop of first class pears.

Spraying with concentrated lime-sulphur in late winter, at a strength of 4-5 degrees Beaumé, for the control of red scale on pear trees has been, and is, practised with varying results by many fruit growers in South Africa. A study of the question of how lime-sulphur kills scale insects (1) indicates that this material has the ability to soften the wax about the margin of the scale insect, clamping it against the surface of the plant, and smothering the insect under the scale. In addition to this property, the lime-sulphur deoxidizes or removes and absorbs some of the oxygen from about the body of the insect under the scale. Young scale insects that are produced by adult female scale insects which survive the dormant spray, crawl away from beneath the bodies of the latter, and are killed by the fumes of sulphur dioxide, which slowly arise from the lime-sulphur dormant spray for some time after it has been applied to the plant. The length of time this gas will arise and be of sufficient concentration to kill the young scale insects is undoubtedly influenced by the temperature and rainfall for several weeks following the application of the spray. The variation each season in these two factors, and the difference in the time of application of the winter spray very probably results in a variation in the efficiency of the spray material.

Records of spray experiments carried out by the writer during the 1920-1921 fruit season at Elsenburg, (2) show that Kieffer pear trees sprayed with commercial concentrated lime-sulphur, diluted at the rate of 1 measure in 10 measures of water, of 4 degrees Beaumé, applied in late winter, before buds had opened, produced 45 per cent. of fruit infested with red scale in comparison with 5 per cent. infestation for trees sprayed with 1-10 dilution in late winter, one foliage spray just before blossoming, and later with two foliage sprays of concentrated lime-sulphur, diluted 1-40, applied with lead arsenate at the time of the two first codling applications. Beurré Hardy and Duchesse pears sprayed with lime-sulphur diluted 1-20 in late winter, before buds had opened, produced respectively 3.3 per cent. and 44 per cent. scale-infested fruit in comparison with nine-tenths of 1 per cent. and 9 per cent. respectively for trees sprayed at the same time with 1-20 diluted lime-sulphur and later with two foliage sprays, diluted 1-40, sprayed during the first two applications of lead arsenate for control of codling-moth.

Table I, recording results of experiments in red-scale control for the 1921-22 fruit season confirms the results obtained the previous season. Records show that one application of concentrated lime-sulphur, applied as a dormant spray, whether diluted at the rate of 1 measure of lime-sulphur in 6½ measures of water, in 8 measures of water, or in 10 measures of water, will not satisfactorily control this

TABLE I.

Records of Pears sprayed with concentrated lime-sulphur to control red scale. Three trees of each variety. Elsenburg, 1921–22.

Variety.	Total Fruit.	Scale-infested.	Per cent. Scale-infested.	Strength Lime-sulphur for Dormant Spray.	Dilution and Number of Sprays. †	Date of Application of Sprays and Remarks.	
Kieffer (*a*) * ...	1,850	709	38·0	6 degrees B.	1 L.S.–6½ W.	19th August.	
Kieffer (*a*) * ...	1,625	836	51·0	4 Do.	1 L.S.–10 W.	19th "	
Kieffer (*a*) * ...	2,288	598	26·0	5 Do.	1 L.S.–8 W.	19th "	
Kieffer (*b*) * ...	3,294	794	24·0	6 Do.	1 L.S.–6½ W.	16th "	Heavy rain 17th and 18th August.
Kieffer (*b*) ...	5,141	885	17·0	5 Do.	Spreader, plus 1 L.S.–8 W.	16th "	(½ lb. calcium caseinate spreader in 40 gals. diluted lime-sulphur).
Kieffer (*b*) ...	5,182	728	14·0	4 Do.	1 L.S.–10 W.	16th "	
Kieffer (*b*) ...	3,074	131	4·2	4 Do.	1–10 : 1–40 : 1–50.	16th "	Dormant spray: 2 foliage sprays of 1 degree Beaumé after blossoming.
Kieffer (*c*) * ...	3,604	2,898	80·0	6 Do.	1 L.S.–6½ W.	16th "	Dormant spray; no foliage sprays.
Kieffer (*c*) ...	6,445	1,410	21·0	5 Do.	1 L.S.–8 W., plus spreader.	16th "	(½ lb. calcium caseinate spreader in 40 gals. diluted lime-sulphur).
Kieffer (*c*) ...	5,531	424	7·8	—	1 miscible oil–18 W.	19th "	South African manufactured miscible oil used.
Duchesse	1,865	93	5·0	4 degrees B.	1–10 : 1–40 : 1–50.	16th "	Dormant spray: 2 foliage sprays of 1 degree Beaumé after blossoming.
Duchesse	2,161	367	16·9	4 Do.	1 L.S.–10 W.	16th "	Dormant spray; no foliage sprays.
Duchesse * ...	1,803	314	17·0	5 Do.	1 L.S.–8 W.	22nd "	
Duchesse * ...	1,483	542	36·5	6 Do.	1 L.S.–6½ W.	16th "	
Louise Bonne ...	4,230	397	9·0	4 Do.	1–10 : 1–45 : 1–45.	22nd "	Dormant spray: 2 foliage sprays after blossoming.
Louise Bonne * ...	1,980	920	46·0	4 Do.	1 L.S.–10 W.	22nd "	Dormant spray; no foliage sprays.
Louise Bonne	2,424	755	31·0	5 Do.	1 L.S.–8 W.	22nd "	
Louise Bonne * ...	1,203	143	11·8	4 Do.	1 L.S.–10 W., plus spreader.	22nd "	(½ lb. calcium caseinate spreader in 40 gals. diluted lime-sulphur.)
Beurré Hardy ...	2,734	191	6·9	6 Do.	1 L.S.–6½ W.	16th "	
Beurré Hardy ..	2,582	31	1·2	4 Do.	1–10 : 1–40 ; 1–50.	22nd "	Dormant spray: 2 foliage sprays after blossoming.
Beurré Hardy * ...	1,151	53	4·6	5 Do.	1 L.S.–8 W., plus spreader.	16th "	Dormant spray; no foliage sprays.
Beurré Hardy ...	2,264	51	2·2	4 Do.	1 L.S.–10 W.	16th "	
Kieffer (*a*) ...	215	163	75·0	—	—	Not sprayed.	One tree.
Kieffer (*b*) ...	609	406	66·0	—	—	Do.	
Duchesse	804	522	64·0	—	—	Do.	
Louise Bonne ...	391	159	40·0	—	—	Do.	
Beurré Hardy ...	308	57	18·0	—	—	Do.	

NOTE.—Kieffer (*a*), (*b*), and (*c*) trees were respectively in different parts of the orchard. * Two trees. L.S. = lime-sulphur concentrated. W. = water.
† Capex concentrated lime-sulphur was used in these experiments. Other brands of equal concentration will probably give as satisfactory results.

pest when the infestation is rather severe. Results demonstrate that one half-pound of calcium caseinate in 40 gallons of diluted concentrated lime-sulphur of 5 degrees Beaumé improves considerably the efficiency of lime-sulphur in the control of red scale. [Compare Kieffer (*b*) 6 degrees Beaumé records with Kieffer (*c*) 5 degrees Beaumé, plus spreader; Louise Bonne, 4 degrees Beaumé and 5 degrees Beaumé records with Louise Bonne 4 degrees Beaumé, plus spreader.] Further experimentation with this material in lime-sulphur may lead to the discovery that one application of the calcium caseinate lime-sulphur mixture, which is much cheaper than a miscible oil, will effectively control severe infestations of red scale on pear trees. Further trials are necessary to determine the question.

Records of the 1921-22 season (see Table I) confirm those of last year (2) in respect to the determination that a dormant spray of concentrated lime-sulphur of 4 degrees Beaumé (1-10 dilution) followed by two foliage applications of concentrated lime-sulphur of 1 degree Beaumé, or slightly less (dilution of 1-40 and 1-50) applied to the trees during the first two codling sprays, will effectively control red scale, and is as efficient as one dormant spray of South African manufactured miscible oil diluted 1-18. [Compare the following records in Table I with other records:—Duchesse, Beurré Hardy, Louise Bonne, and Kieffer (*b*) 4 degrees Beaumé, plus two foliage sprays of lime-sulphur, and Kieffer (*c*) miscible oil 1-18.] Concentrated lime-sulphur, diluted either 1-40 or 1-50 was found during both seasons to cause some burning of foliage, not sufficient to affect the crops of fruit, but possibly enough to cause some alarm among very cautious fruit growers. During the 1921-22 season, the foliage of the Duchesse variety was more susceptible to burning than that of the Louise Bonne, Kieffer, Forelle, and Beurré Hardy varieties, but not so severe as to affect the fruit crop. It is interesting to note that burning of foliage in the Forelle and Duchesse trees occurred about a day after the application of the first foliage spray. The burning was immediately preceded by a heavy fall of dew, followed by sunshine. The burning was somewhat intensified in these varieties, and first appeared in the Kieffer, Louise Bonne, and Beurré Hardy trees a number of days after the application of the sprays, and not until the temperature reached 90 degrees Fahrenheit.

Although the writer hesitates, on account of a certain amount of burning of foliage, to go so far as to advise fruit growers in the coastal regions of the Cape Province to substitute diluted concentrated lime-sulphur for Bordeaux where red scale or mites and fusicladium must be combated, he may state that this material has been used in the Elsenburg orchard for two successive years, and that he knows of several progressive fruit growers in the Western Province coastal region who have used this insecticide as a foliage spray for several years without affecting the crops. Further experimentation will be continued at Elsenburg to determine if burning of foliage may be avoided, and if self-boiled lime-sulphur, which is less likely to cause burning, may be effectively substituted for the concentrated.

SUMMARY AND CONCLUSIONS.

(*a*) A dormant spray of concentrated lime-sulphur, concentrated to 4, 5, or 6 degrees Beaumé, will not satisfactorily control red scale on pear trees when infestation is considerable.

(*b*) One half-pound of calcium caseinate in 40 gallons of concentrated lime-sulphur, diluted to 5 degrees Beaumé (1-8) will control red scale considerably more effectively than the same mixture with calcium caseinate omitted.

(*c*) A dormant spray of concentrated lime-sulphur of 4 degrees Beaumé, followed by two foliage sprays of 1 degree Beaumé or slightly less (diluted 1-50) will effectively control red scale.

(*d*) Concentrated lime-sulphur diluted to 1 degree Beaumé or slightly less causes some burning of foliage even in coastal regions, but evidently not sufficient to affect the crop. It cannot be recommended in inland districts, and should be applied with caution in coastal regions.

(*e*) South African manufactured miscible oil, diluted 1-18, controlled red scale during 1921-22 fruit season as effectively as one dormant spray of concentrated lime-sulphur of 4 degrees Beaumé (1-10) followed by two foliage sprays of concentrated lime-sulphur of approximately 1 degree Beaumé, applied at the time of the first two codling sprays. Miscible oil is, however, considerably more expensive, and especially when a fungicide must be used as a foliage spray.

SUGGESTIONS CONCERNING SPRAY PROGRAMME.

Spray programme for pear varieties infested with red scale, fusicladium, and codling-moth.—For such varieties, e.g. possibly Louise Bonne and Forelle, a most economical and effective spray calendar, as well as one not likely to cause burning, is as follows:—First spray—concentrated lime-sulphur of 5 degrees Beaumé (diluted 1-9 if Capex is used), applied as late in winter as possible, but before the buds open; 2nd spray—concentrated lime-sulphur of 1 degree Beaumé (diluted 1-40), applied when flower-buds are green and clustered; 3rd spray—concentrated lime-sulphur, diluted 1-50, applied when the flower-buds are pink and separated, but not open; 4th spray—1½ lb. lead arsenate powder in 50 gallons of bordeaux (4-4-50 formula), applied as soon as practically all petals have dropped; 5th spray—1½ lb. of lead arsenate powder in 50 gallons of bordeaux (4-4-50 formula), applied ten days later than the fourth spray. The later sprays, for codling-moth control only, should consist of 1¼ lb. of lead arsenate powder in 40 gallons of water.

Spray programme for pear varieties badly infested with red scale or bryobia mite and codling-moth, but not infested with fusicladium, e.g. possibly Kieffer and Duchesse.—1st spray—miscible oil, applied as late in winter as possible, but before buds open; 2nd spray—1¼ lb. lead arsenate powder in 40 gallons of water, applied as soon as all petals have dropped. All later applications for codling-moth control should consist of the same material as the second spray.

An alternative spray programme for such varieties, which would cost a little less, but which, during some seasons, might result in a little burning of foliage, would be:—1st spray—concentrated lime-sulphur 4 degrees Beaumé (e.g Capex 1-9); 2nd spray—1¼ lb. lead arsenate powder in 40 gallons of water, applied when the petals have dropped; 3rd spray—1½ lb. lead arsenate powder in 50 gallons of concentrated lime-sulphur, diluted 1-50, applied ten days to two

weeks after the second spray; all later sprays, 1¼ lb. lead arsenate powder in 40 gallons of water.

For varieties not badly infested with red scale and not infested with fusicladium.—1st spray—concentrated lime-sulphur of 3 degrees Beaumé (e.g. Capex 1-9), applied as late in winter as possible, but before the buds open; 2nd spray—1¼ lb. lead arsenate powder in 40 gallons of water, applied when petals have dropped; all later sprays, for codling-moth control, should consist of the same material as the second spray.

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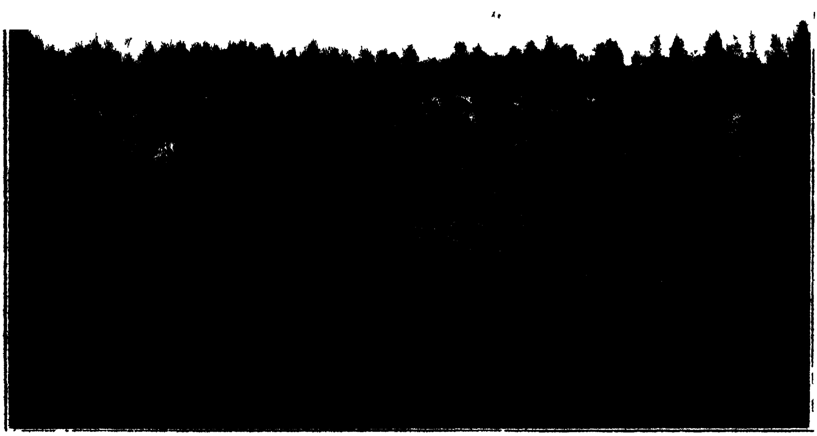
(2) *Journal of the Department of Agriculture*, September, 1921, "The Spraying of Fruit Trees," by F. W. Pettey.



Cattle Grazing in Fields of Salt Bush.—Grootfontein School of Agriculture, Middelburg, Cape Province.

Victualling Ships with South African Produce.

As a result of inquiries instituted by the South African Trade Commissioner for Commerce at Rotterdam, the Woermann Linie and Deutsch Ost-Afrika Linie have decided to provision their ships as much as possible in South Africa. The South African agents for these lines are Messrs. Poppe, Schunhoff & Guttery, P.O. Box 132, Capetown.

MUSHROOM GROWING.

By A. M. BOTTOMLEY, B.A., Mycologist, Division of Botany and Plant Mycology.

MUSHROOM growing is not, as many people seem to imagine, a difficult process or one that requires special knowledge. On the contrary, mushrooms are an easy crop to grow, and beginners are often as successful with them as growers with considerable experience. They have the advantage, moreover, of occupying little space and, apart from the preparation of the beds, are a clean crop to handle. As with any other industry, however, success depends on general conditions, good materials, interest in the business, and intelligent management.

THE MUSHROOM PLANT.

The term "Mushroom" is the popular name applied to those members of the "gill-bearing" fungi which are considered to be edible, and is often used in contradistinction to the poisonous members of the family commonly known as "toadstools." The form most familiar to people is that of the common mushroom, known as *Agaricus campestris* This consists of an umbrella-shaped structure with a whitish stalk and a cream to brownish cap, on the underside of which are "gills" or plates radiating from the stalk. When young or in the "button" stage these gills are hidden by a skin known as the "veil," which breaks away as the mushroom expands, leaving a ring round the stalk and exposing the gills, which are at first pale pink in colour but rapidly change to a dark brown on maturity. On the gills are borne the spores—very minute bodies—which are equivalent to seeds in ordinary plants, and serve to propagate the plant. These may be seen by laying a ripe cap, gills downwards, on white paper for a few hours, when they will be found to have been shed in a dark powder along lines corresponding with the arrangement of the gills. In nature, these spores fall to the ground, germinate, and ulimately give rise to a mass of white threads known as the mycelium. The mushroom itself originates as a small, round, white structure, which develops at the junction of some of the thicker threads. It constitutes the fruiting portion of the plant, while the vegetative part consists of the underground mycelium.

CULTIVATION FROM SPORES.

In nature, the propagation of these fungi is probably effected by means of the spores, but under artificial conditions this is not the case, owing to the difficulty experienced in germinating the spores. The process by which mushrooms are cultivated in this way is a secret one and known only to a few.

CULTIVATION FROM SPAWN.

For all general purposes, mushrooms are cultivated from "spawn." Strictly speaking, spawn is the mycelium of the fungus, but in a commercial sense it is used to include both the mycelium and the medium in which it is carried and preserved. Spawn may be obtained in two forms—"flake" spawn and "brick" spawn,

both made up of a medium consisting chiefly of manure with mycelium running through it. Of these two, brick spawn is usually the more satisfactory, owing to the fact that flake spawn, as the name implies, is in a loose form, and the mycelium is consequently more accessible to the deleterious effects of the atmosphere. Brick spawn is put up in bricks of dry dust manure, which measure about 5 by 8 by 1½ in., and weigh 1¼ lb. In the latter form, spawn remains in good condition for several years, and there is usually no danger in using spawn 2-3 years old. However, it deteriorates with age, and new spawn is therefore better than old.

ESSENTIAL CONDITIONS FOR MUSHROOM GROWING.

Mushrooms can be grown almost anywhere, out of doors or indoors, in any climate and in any season, provided the essential conditions are obtainable. These are:—(1) A temperature ranging from 53° to 60° F.; (2) a moist atmosphere; (3) proper ventilation; (4) a suitable medium or bed; (5) good spawn.

Where to Grow Mushrooms.—Among the most desirable places in which to grow mushrooms are barns, cellars, sheds, pits, greenhouses, and proper mushroom houses, though with a little care they can be grown quite successfully in sheltered places out of doors. Darkness is not essential, but as the temperature and moisture are more apt to be equable in dark places than in open, light ones, mushrooms are usually grown in the dark.

Moisture.—Moisture is an important factor in the cultivation of the mushroom, and requires intelligent control, for although the atmosphere requires to be nearly saturated with moisture, water should not as far as possible be applied directly to the beds. Care should therefore be taken that the latter are sufficiently moist when made up, and further that evaporation is reduced to a minimum. However, the beds must not be allowed to dry out, and should any danger of this occur lukewarm water may be applied to the beds by means of a watering-can.

Ventilation.—While proper ventilation ensuring a free interchange of pure air is likewise an essential factor in mushroom growing, care should be taken that draughts are avoided, as these cool the beds and cause too much evaporation.

THE MUSHROOM BEDS.

Preparation of the Manure.—Mushroom beds are usually made of horse manure which has been subjected to a process of curing. Growers have different ways of curing, but the results aimed at in each case are the same, viz. to secure thorough fermentation, to prevent the temperature from rising too high during fermentation, and to prevent the material from drying out or burning or becoming too wet. One method in practice is as follows:—Fresh horse manure (obtained preferably from horses fed on hard food, such as hay and grain) is put into a shed and left for a few days. It is then piled into heaps about 2 ft. thick, and is well turned over every second morning for about ten days. After this it is turned less frequently and left until suitable for bedding. This stage is reached when the temperature no longer rises above 100-120° F. The manure itself must have lost its "fresh manure" smell, and must have a "sweet" smell. It should not be too dry, otherwise the spawn will not grow, nor should it be too wet, or the spawn will rot.

It should be a dark brown colour mixed with white and should feel unctuous, elastic, and moist, but should not leave any moisture in the hand when squeezed. If during the process of curing, the manure becomes too dry, it may be sprinkled with water, but owing to the fact that watering tends to increase the rapidity of fermentation and the elevation of the temperature, and that spawn rots in very wet material, it should be used with caution. Some growers prefer to add soil to the manure in the proportion of 1 part to 8 or 9 parts manure, but this is not generally considered necessary unless it is wished to increase the bulk of the material.

Bedding and Spawning.—As soon as the manure is ready it is made into beds. These may be in the "ridge" formation, which allows of a big surface extent, but the more general way is to make flat beds. These may be of any size convenient to handle, and should be from 8 to 18 inches deep. The manure is compressed as firmly as possible, and the beds are left till the temperature is about 80° F., when they are ready for spawning.

The point at which the beds are ready for planting the spawn seems to be one of the most important and critical features of the business. The manure must be properly cured and the temperature of the beds (tested with a thermometer) must not be above 90° and not below 70° F. There is a diversity of opinion about the optimum temperature, but it is probably about 80° F.

Spawning consists in planting pieces of living spawn into the prepared beds. The "bricks" are broken up into pieces about 2 to 3 inches in diameter, and these are planted 2-3 inches (some growers prefer more) deep, 7-9 inches apart, in rows about 9 inches apart. The surface is then again made firm, and the beds are left for a further 3-14 days (according to the rapidity with which the spawn grows), after which they are covered with a 2-inch layer of finely screened, slightly moist loam, which is also firmly pressed down. Some growers plant the spawn at once into the beds; others, however, break it up and leave the pieces on the top of the beds for a few days before planting, so that they can absorb a certain amount of moisture. The beds are then left as they are; some growers cover them with a layer of straw or hay, which helps to keep in the moisture. If the beds dry out too much they should be lightly watered with lukewarm water.

Picking and Marketing.—Mushrooms should appear 5-10 weeks after spawning, and should continue growing for from two to four months. The crop varies, but a good mushroom bed should yield from 1½-2 lb. per square foot.

Picking should start when the mushrooms are in the button stage, i.e. before the veils have broken. The stem should be twisted not broken or pulled from the soil, and the hole filled in with fresh soil, otherwise decay might set up in remaining pieces of stalk and spread through the bed.

Mushrooms for the market should be sorted to size and colour, removed of all soil, and packed according to weight in baskets or boxes. They will not keep for any length of time, so should be dispatched as soon as possible after packing.

Old Beds.—It is not practicable to raise mushrooms on old beds. The old material can be used for garden purposes, and should be removed after each crop and the house or shed, etc., thoroughly cleaned before new beds are made.

ACUTE TYMPANITES OR HOVEN IN CATTLE.

By P. R. VILJOEN, Dr.Med.Vet.(Berne), Division of Veterinary Education and Research.

THIS condition may be defined as an abnormal accumulation of gases in the large stomach, producing great distension of this organ with subsequent paralysis of its walls.

CAUSES.

These may be due (1) to accumulation of gases naturally formed as the result of obstruction in the gullet which is their normal exit; and (2) to excessive formation and accumulation of gases in the stomach owing to causes originating in the stomach itself.

(1) Obstruction in the gullet is of common occurrence in countries where cattle are fed largely on roots (mangels, turnips, potatoes, etc.). Owing to abnormal shape or size a piece of food may get stuck in any part of the gullet, and when it cannot be moved on by the muscular contractions of this organ, obstruction in the lumen of the gullet becomes so complete that not even gases are allowed to escape. In the normal animal eructation of the gases formed in the stomach occurs at frequent intervals, but when owing to obstruction in the gullet this function does not take place, accumulation of gases occurs in the stomach.

(2) By far the commonest cause of hoven is an excessive production of gases in the stomach or an abnormal accumulation due to the absence of active movement of the walls of this organ.

Among the causes of excessive production of gas may be mentioned foodstuffs easily fermented, too rapid and too large consumption of green foods, etc. Farmers know the danger of suddenly turning animals into a field of lucerne, kaffir corn, etc., the risk of hoven ensuing being especially great when the lucerne or other green food is wet with dew or rain or is wilted. Perfectly sound food may be productive of tympanites when hungry animals devour large quantities.

Among other causes may be mentioned vegetable poisons, such as tulp, etc., and the presence of foreign bodies in the stomachs interfering with the movement of these organs.

SYMPTOMS.

Cases of acute tympanites usually develop very suddenly and are easy to diagnose. There is an enormous increase in the size of the abdomen especially marked in the left flank, and the animal shows marked uneasiness, such as crouching, stamping with its feet, kicking at the abdomen or arching its back. Practically no faeces are passed and the movements of the bowels are at a standstill. The pressure of the distended stomach on the lungs and heart causes distressed and difficult breathing, the animal's nostrils and mouth being wide open, and the tongue hanging out. Later, again owing to pressure of the

stomach on the internal organs and blood vessels, the blood is driven out towards the exterior with the result that the superficial veins, especially those of the head and neck, become greatly distended. The lining of the mouth, nose, eyes, etc., becomes of a purplish colour owing to accumulation of venous blood.

Unless immediate relief is afforded, suffocation sets in, the animal staggering and falling insensible on the ground.

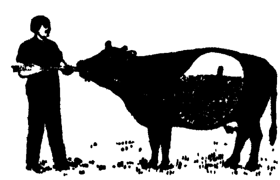
Death usually takes place in two to three hours, but sometimes even sooner.

TREATMENT.

Preventive consists in proper animal management, such as gradual introduction of changes in feeding, etc.

Curative, if it is to be effective, must be applied as soon as the condition has been diagnosed. The first thing to do is to remove some of the accumulated gas. This can be done in two ways, namely:—

(1) By puncturing the rumen, i.e. thrusting a pocket-knife, or special trocar and canula through the skin and abdominal wall of the left flank straight into the stomach. This method must be adopted when no proper instrument is available. The chief danger connected with this operation is that some of the food, liquid, etc., may escape



into the abdominal cavity, and there set up inflammation of its lining membrane.

(2) Insertion of the stomach tube or probang. By this tube a sure escape for the gases can be provided at very little risk to the animal, no wound being inflicted on the animal as in the previous method. In the case of obstruction in the gullet such an instrument is essential for its removal.

A GREATLY IMPROVED STOMACH TUBE.

Dr. Nuesch, of Switzerland, has recently produced a greatly improved form of stomach tube. It consists of a 6½ feet long metal (aluminium) hollow tube, the free end of which is cup shaped; the stomach end, however, consists of a flexible piece, 5 inches long, which is so arranged that when it reaches any light obstruction in the stomach, it will turn upwards. This means that the opening will be found above the mass of food in the stomach and hence the tube does not become choked with food, but allows free escape for the gases. The older types of probangs did not have this device, with the result that the stomach end got embedded in the mass of food, and thus the escape of gases was prevented. The stomach tube is introduced in the following way:—

The animal's head is held straight out in a forward and upward direction, so that the nose is on a level with the back. A mouth gag,

consisting of a short stout piece of wood with a hole through its central part, is fixed in the mouth. After oiling the whole tube well, the flexible end is passed through the hole in the mouth gag along the roof of the mouth at first very cautiously, as there is a slight danger of it entering the windpipe. When this happens, the animal will start coughing, in which case the tube must be withdrawn immediately. After the tube has entered the gullet it may be pushed in quickly, but later when it passes into the stomach gentle pushing must again be resorted to. In the metal cup of the free end a small hole is present, and this must be on top when the tube has entered the stomach, since it is specially intended to indicate the correct direction which the tube should take in the stomach.

As soon as the tube has been inserted, the gas will rush out from its free end, but should this not take place immediately, or in the event of the flow of gas being interrupted, the tube may be withdrawn for about half its length, and then pushed in again. The probang may also be withdrawn for the purpose of cleaning, etc., and introduced again.

AFTER THE OPERATION.

After all or most of the gas has escaped, medicinal agents, such as ammonium carbonate 1 oz., or sodium bicarbonate 1-2 oz., or 2 oz. turpentine in ½ bottle of milk, may be introduced into the stomach through the opening of the tube.

The animal should then be kept quiet and food given very sparingly for a few days until the stomach has resumed its normal functions.

If after 24 hours the bowels have not acted, a saline purgative, such as ½ lb. each of common salts and epsom salts, mixed in 4 bottles lukewarm water, may be given. Medicines having a tonic or stimulating effect on the stomach are then indicated and the following mixture may be tried:—Powdered nux vomica, 1 dram; powdered ginger, 2 drams; powdered gentian, 2 drams.

The quantities given are intended for one dose, and two doses should be given per day for about 6 or 7 days, or until improvement takes place.

OBSTRUCTION IN THE GULLET.

When the hoven is due to an obstruction in the gullet, the tube should be employed to push the obstructing body gently and gradually towards the stomach. In such a case it may be found necessary to reverse the tube and insert the cup-shaped end first. When this method fails owing to the obstructing body being too large or too firmly fixed in the gullet, surgical measures may have to be resorted to to effect its removal. If the body is of a soft nature (piece of root, etc.), it may be left in the gullet for a few days when maceration will have the effect of reducing its size. In this case puncturing the rumen must be carried out to allow the accumulated gases to escape, and moreover, the canula must be left in situ in the stomach, so as to provide free exit for gases which will form afterwards.

In conclusion, cattle farmers, especially those in possession of pedigree stock, are advised to keep the instrument described here, Dr. Nuesch's stomach tube, on the farm, because it may come in very handy, and be the means of saving the lives of some of their animals.

SOUTH AFRICAN FRUIT ON THE CONTINENT.

The Position at Rotterdam.

Mr. K. Spilhaus, the Union's Commissioner of Commerce at Rotterdam, has been investigating the handling of fruit at his centre, and in reporting the position, states:—

Regular and direct cold storage freight is essential for the development of regular and direct business with the Continent. This is at present not available. The Holland-South Africa Line have two steamers provided with such accommodation, and there might be other opportunities periodically. This means that comparatively large quantities arrive at one time which cannot be promptly taken up by the market. Fruit dealers who are not able to draw their supplies regularly, buy more than they can quickly dispose of, and therefore require a bigger margin of profit to cover the risk of loss. This means high prices and consequent restriction of consumption. Further, the arrival of a shipment in a hungry market means that very high prices are paid at auction. The fruiterer pays these because he cannot allow his neighbour to show fruit for sale which he himself has not got. This often results in disappointment and loss to the retailers, and when the next shipments arrive they are afraid to touch South African fruit. If the fruit is sold at too low a price, the farmer cannot continue to ship; if it is sold at too high a price, the fruiterer loses money and takes no further interest in the trade.

In order to work the business up, it is necessary that the risk to shipper and retailer should be reduced as much as possible. The smaller the risk, the smaller the profit, and the greater the volume of business.

I must first of all explain how the business in South African fruit is carried on here. Certain local firms receive consignments. These are discharged into lighter or into wharf sheds. Sample boxes are taken from the shipment to an auction room, where the auctioneer sells the fruit on sample to the highest bidder in lots suitable to the trade.

This procedure in my opinion is bad, because once the fruit is taken out of cold storage, it must be sold, and the bids made, rightly or wrongly, establish the value, so to say, at once, and it is difficult, even if fruit is withdrawn, to get much more later on. But if the auctioneer fixes his minimum price at, say, 3 fl., he may sell nothing at the sale, but he still has the chance of selling at this price later on if a demand springs up. The fixing of a minimum price should not be a difficult matter, as the London prices are known, and it must therefore not be fixed so high as to make it worth while for a local fruiterer to buy his requirements in London and leave the goods here unsold. If fruit is sold much below London value, as it was in the case of one shipment, it is not only bad for the shippers; it also

hits the fruiterer who has fruit on hand which he bought at a higher price previously, and it will have a very bad influence on the London market, which is, after all, our principal market, and one which we must protect.

I do not think that there is any trade which is in greater need of organization and control than the fresh fruit trade. It requires organization because it is a trade in perishable goods; it requires control because fruit is a luxury, and therefore prices are determined by the fancy of the buyers.

To develop the business successfully, we must strive for two things—

(a) The provision of cold storage accommodation on all the passenger steamers running direct to the Continent.

(b) A regular supply to the market and at prices more or less in line with London values.

How can we feed the market regularly at present? To a certain extent it is done from London. Fruiterers buy our fruit in London if they cannot buy here, but this means extra expense, and transhipment may cause depreciation in quality, but to feed the market regularly by direct shipments is at present impossible.

The Holland-South Africa Line have two steamers, the "Rietfontein" and "Randfontein," fitted with 36,000 cubic feet refrigerating space each, while the Holland-East Africa Line have in their service the "Meliskerk," which has a refrigerating space of 1,625 tons' measurement. Any shipments arriving by these direct steamers would easily flood the market.

I have gone very carefully into the matter with the shipping company, fruit merchants, and cold storage people, and at a meeting which was held in my office, the Holland-South Africa Line agreed to discharge fruit only on the wharf, and if required, only in the early morning or late evening. It was decided that it was in the interest of the fruit trade that arrangements should be made for the fruit to be taken into cold storage straight from the ship, and in case of large quantities the Holland-South Africa Line agreed to haul their steamers to Van Staay's Wharf, charging the consigners actual tug charges amounting to about 1.250 fl., so that the fruit could be carried from the ship's slings straight into the cool chambers of that company. The extra charges for putting fruit into the cold storage, including two weeks' storage, amount to roughly 1½d. per small box, according to the company's tariff of charges.

I recommend, therefore, that shippers instruct their agents to put their fruit from the steamer's cool chambers straight into cold storage here, that their agents be instructed to fix selling limits in collaboration with me, and that fruit should only be taken out of cold storage as it is sold.

Any damaged fruit would naturally have to be sold at once

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PRINCIPAL AGRICULTURAL ACTS OF THE UNION.

II.

An Outline of the Agricultural Pests Act, No. 11 of 1911.

THE ACT.

THE object of this Act is to prevent the introduction into and spread within the Union of insect pests, plant diseases, and bee diseases; to regulate the importation into the Union of exotic animals, that is, those not indigenous to this country; and to provide for the suppression of locusts.

Nurseries.—The opening portion of the Act deals with this subject; it requires every person who has a nursery to register it, and provides for its inspection by an official to see whether any insect pest or disease is present. If such is the case the nursery, or part of it, will be placed in quarantine; during that period no plants may be removed from the quarantined area. Quarantine may be either for a definite or indefinite period; in the latter case it may be removed upon application and after inspection shows that the danger is over and the fees of inspection have been paid. Unless specially exempted, every nursery must be provided with an approved chamber for the disinfection of plants. Plants in a nursery found to be infected with any insect pest or plant disease are liable to destruction, without compensation, and plants not so infected but liable to become so may also be ordered to be destroyed, subject to compensation. No other compensation is provided for in the Act.

Introduction of Plants.—Introductions of plants are governed in three ways: Certain are entirely prohibited, others are subject to special supervision or restriction in the matter of permits, while some are not hindered in any way. No plants (that is, any tree, shrub, or vegetation, and the fruit, leaves, cuttings, or bark thereof; also any live portion of a plant; but not any seed unless specially mentioned) may be imported without a permit, excepting fruit, bulbs, tubers (including *dahlia* and other tuberous roots), vegetables, and such portions of plants as cannot be propagated, but the introduction of eucalyptus, acacia, or coniferous plants from oversea, also fresh grapes and peach stones, is prohibited, while grape vines and plants of the same family, sugar-canes, plants for rubber and for tea cultivation, and cotton-seeds may only be introduced under permit and subject to special supervision by the Government. The above list may be varied, by withdrawal or addition, by proclamation, and at present it may be pointed out that the grain of maize and barley, cotton-seeds with lint attached, cotton-lint in which any cotton-seeds are contained, lucerne-seed, and lucerne plants or any portion thereof, have been proclaimed as prohibited introductions excepting under special permit and subject

to certain conditions; while fresh stone fruits, including apricots, plums, peaches, nectarines, and cherries, and certain rooted stocks for budding or grafting, were long since added to the list of plants whose introduction is totally prohibited.

Any plant introduced in contravention may be destroyed.

On arrival, any plant from oversea is subject to inspection by an officer, who must be afforded every facility to do so, and may order disinfection, the cost of which must be borne by the consignee. When required to do so, any one importing any plant must certify in writing full particulars regarding the consignment and the place of origin, and false information in this respect is punishable. If any such plant is found to be infected with insect pest or plant disease, it may be cleansed at the expense of the importer; if this is not done or be found ineffective, the plant may be destroyed, together with packing material, etc.

Scope of the Act.—The Governor-General may by proclamation in the *Gazette* amend, by addition or withdrawal, the list of any plants or seeds, the introduction of which is prohibited, supervised, or restricted, and regulate the traffic in plants within the Union; he may empower an officer to enter premises to ascertain whether any insect pest or plant disease is present, and, if discovered, to take the prescribed steps for eradicating the same, and also for imposing quarantine.

Locust Destruction.—The second chapter of the Act deals with this subject. Certain sections have been amended by Act No. 12 of 1922, and the two will be taken in conjunction.

Whenever locusts deposit their eggs or voetgangers in swarm formation appear on any land, the occupier must speedily report to the nearest magistrate, field cornet, or police, giving full particulars. If it happens within a native reserve or location, the head of the kraal must report to the headman, who must report to his magistrate. At the same time the swarm of voetgangers must immediately be destroyed, and materials for the purpose will be obtainable at the magistrate's court office of the district or at special depots. Any one misapplying materials obtained, wasting them, or failing to return any apparatus, is liable to punishment. Where an occupier fails to destroy the voetgangers this may be done at his expense by the Department and the cost recovered from him in any competent court; the amount of expenses may be assessed by the court. Where there is no occupier, the owner of the land will be liable for the expenses of destruction. In the case of native reserves or locations, the male inhabitants responsible for failure to destroy will be liable for the expenses which will be recovered from them pro rata in the same manner as a native poll tax or hut tax. Moreover, any inhabitant who fails to obey the orders of the headman in destroying voetgangers in the native location or reserve is guilty of an offence and liable to punishment. In the case of land not a native reserve or location, but which is occupied solely by natives, the expenses will be similarly collected pro rata from all male inhabitants that are subject to native poll or hut tax.

Any occupier who allows voetgangers to go from his land to that of his neighbour's is liable to punishment, unless he can prove that they were threatening his crops and that in driving them away he took all possible steps to destroy them, and did not drive them towards the growing crops of his neighbour.

Bee Diseases and Exotic Animals.—Bees, or their larvae or eggs, honey, used beehives or accessories, or any things which have been used to contain or manipulate bees; and honey, or beeswax, may not be imported from oversea into the Union. If this is done the goods are liable to confiscation and destruction, and the importer to punishment. Any class of exotic animal may be prohibited from introduction, or be allowed in under certain restrictions only, and particulars of the animals concerned, and also the restrictions, are published in the *Gazette*.

An officer is empowered to inspect any consignment to ascertain whether any article or thing or any exotic animal is being imported in contravention of the Act, any apiary or place where bees are kept, any beehive, honey, or beeswax intended for sale; and any premises where exotic animals are kept. All directions he may give for disinfection, cleansing, or destruction, etc., must be carried out by those responsible within the specified time, otherwise the work will be done at their expense, in addition to which they are liable to punishment.

General.—Under this heading the last portion of the Act empowers officers of the Department to enter on any land for the purposes of the Act and its regulations, and every assistance must be rendered them in this respect. Any obstruction, etc., is punishable. Excepting where it has been stated above, no compensation is payable in connection with any loss incurred through the carrying out of the Act and its regulations.

The Act concludes with the penalties to which offenders are subject, and details the powers of the Governor-General in the making of regulations, the principal of which will follow.

Citrus Canker.—Owing to the discovery of the disease in the Union, Act No. 10 of 1919 was passed, which amends Act No. 11 of 1911 in respect of land or plants infected with citrus canker. Except with the permission of the Minister of Agriculture, no one is permitted to plant, raise, or keep any citrus plant on land (and land contiguous thereto) where citrus canker is present, or other land quarantined or restricted in this connection.

Certain areas were proclaimed in the Rustenburg, Waterberg, and Pretoria Districts from which any citrus trees or any portions thereof may not be removed.

THE REGULATIONS.

The Act as outlined above lays down certain principles and empowers the making of regulations which bring the principles into action and also extend them. The chief regulations are set out below, not in chronological order, but in main groups. In some cases specific portions of the Act are repeated.

IMPORTATION OF PLANTS.

Ports of Entry.—Plants, fruits, etc., may only be introduced from oversea by post or through a prescribed port. All admissible kinds may enter through *Capetown*, *Durban*, *East London*, *Port Elizabeth*, and *Komatipoort*. Fruit, potatoes, and onions may also enter through Simonstown, Mossel Bay, and Port Nolloth.

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Introductions from oversea through Komatipoort are subject to the submittal of the articles for inspection at Pretoria, the importer paying the conveyance charges.

Plants that arrive by sea from a place beyond the borders of the Union are regarded as having come from oversea, and plants that come overland from *Portuguese East Africa* and *South-West Africa* are subject to the same restrictions as plants from oversea. Plant traffic from *Rhodesia* or from any other British territory bordering on the Union is treated in the same manner as traffic from one part of the Union to another part.

Prohibitions.—The introduction of all *eucalyptus*, *acacia*, and *coniferous plants*, *peach* stones, fresh *stone fruits*, and of *rooted stocks for budding or grafting*, except almond, pear, plum, and cherry, is totally prohibited.

Coniferous plants include pines, larches, hemlocks, spruces, firs, cedars, and araucarias, and the prohibition is applied to any such plant even should it be a dwarfed specimen for interior decoration.

Stone fruits include apricots, plums, peaches, nectarines, and cherries.

Grapes may be introduced through any of the appointed ports of entry, but may not be removed to parts of the Union into which their removal from other parts of the Union is prohibited Information concerning the restrictions on the removal of plants and fruit from one part of the Union to another, as provided for in the regulations, will be furnished to applicants.

General Restrictions respecting Permits.—Permits are granted in accordance with the following general rules, (*a*) and (*b*) of which are fixed by regulation:—

(*a*) Permits will not be issued for trees or plants, except fruit tree stocks, ordinarily *raised from seed* if the seed be easily procurable in South Africa, or can readily be introduced in a viable condition.

(*b*) Permits will not be issued to any person during any one calendar year for more than *ten plants* of a variety in the case of forest, ornamental, and nut trees, fruit trees exclusive of fruit-tree stocks, ornamental shrubs, woody climbing plants, roses, and fruit-bearing plants exclusive of strawberries, or for more than *one hundred* of a variety in the case of strawberry plants, scions, and unrooted cuttings of any tree, rose, or fruit-bearing plant.

(*c*) Permits will not be issued for any kind of plant procurable from the Forest Department of the Government, nor for any kind of oak tree or plane tree.

(*d*) Permits will be issued for the introduction of *sugar-canes*, plants for the production of *rubber*, and *tea* plants only when it is arranged that the plants be grown for a period on a prescribed site, and subject to destruction, without compensation, should any of them prove to be diseased.

(*e*) Permits will not be given to introduce a plant from a district where that kind of plant is known to be subject to a dangerous disease or insect pest liable to be introduced

with the plant, providing the same kind of plant can be obtained elsewhere. If granted, any such permit is liable to be made conditional on the exercise of special precautions.

A permit will not be honoured as applicable to any particular plant of a kind of which unlimited numbers may not be introduced, unless the plant bears a label corresponding with the name given in the permit, or unless it is otherwise satisfactorily identified as a plant of the particular kind or the particular variety as the case may be. Invoice entries alone are not acceptable as evidence that plants are of various varieties, unless bona fide varietal names are given and it be practicable for the inspector to connect these names with the particular plants to which it is claimed that each refers.

Permits: Trees, Roses, and Fruit-bearing Plants.—Permits for *trees*, *roses*, and *fruit-bearing plants*, in addition to being limited with respect to the number of the plants, are strictly limited to varieties not listed by nurserymen in the Union and procurable from them at or below the ordinary price for recent novelties of their class, unless convincing evidence is adduced to show that the strain of the variety procurable in the Union is an inferior one or untrue to type.

A variety is considered " listed " if it is listed in the latest catalogue of three nurserymen who propagate plants of its kind in quantity; and it is considered " procurable " if the nurserymen can supply it at once, or will book or have booked for fulfilment within a year orders for it on any stock, and if the price does not in the case of a rose exceed five shillings a plant, or in the case of a deciduous fruit exceed seven shillings and sixpence, or in the case of a citrus fruit tree exceed ten shillings and sixpence.

A permit will not be given for any variety of *oak* tree (*Quercus*) or *plane* tree (*Platanus*) for fear an introduction might bring a pest that would seriously detract from the present value of these kinds of trees. A permit would be given for budded or grafted varieties of other trees providing that such varieties were not procurable in the country and were not of prohibited kinds.

Fruit-bearing plants include *grape vines*, *blackberry*, *raspberry*, *currant*, *gooseberry*, and *strawberry* plants, *banana* and *pineapple* plants, *passion fruit* plants, *date palms*, etc.

Permits to introduce *grape vines*, *currant* or *gooseberry* plants, *walnut* or *chestnut* trees, from anywhere, or to introduce *stone fruit trees* (peach, plum, etc.), or *pome fruit trees* (apple, pear, etc.), from North America, are made conditional on the plants being cut back severely and submitted, without expense to the Government, at Capetown or Pretoria, for special inspection and special disinfection. Permits to admit grape vines for a large area in the south-west of the Cape Province and into the district of Graaff-Reinet are also made subject to the observance of the precautions specified above for sugarcanes, etc.

Permits: Shrubs and Woody Climbing Plants.—Permits to introduce ornamental shrubs, including *azaleas*, *rhododendrons*, *camellias*, *hydrangeas*, *spiraeas*, *lilacs*, and *oleanders*, and for climbing plants, including *clematis*, *bignonias*, *passifloras*, *wisterias*, *honeysuckles*, *jasminums*, and *solanums*, are granted on the same conditions that apply to trees and roses, except that they are given for varieties which,

though catalogued by nurserymen, are not extensively propagated in the Union.

Permits for ornamental plants of the vine family, and for ornamentals of the same genus as gooseberries (*Ribes*) are given only under the special conditions that rule for vines and currants respectively.

Permits are not given in the absence of the varietal names if the application embraces more than ten plants of the same general name; and the granting of a permit or permits for an aggregate of ten plants of the same general name without varietal names being given, prevents the issue of any further permit for plants of that kind to the same party in the same year.

If the choice of varieties be left to the supplier and the obtaining of the permit consequently have to be deferred until the plants are dispatched, it is advisable that the supplier be specially cautioned to have the varieties itemized on the invoices, and to have the plants correspondingly labelled.

Permits: Fruit-tree Stocks, Palms, and Herbaceous Plants.—In accordance with the special provision of the gazetted regulations, permits are given to admit of the introduction of *any number* of the admissible rooted stocks for budding or grafting, namely, *almond, pear, plum, cherry,* and any number of *ornamental palms,* and such florists' plants as *violets, carnations, chrysanthemums, geraniums, pelargoniums, fuchsias, orchids,* and *ferns.* The provision with respect to florists' plants is construed to mean that permits shall also be given for any number of any kind of *herbaceous* or *soft and succulent stemmed* plant that is not debarred by any other provision of the regulations, including that provision debarring plants ordinarily raised from seed.

By "herbaceous" plants are meant perennials that die to the ground every year, and also annuals and biennials; and by "soft and succulent stemmed" plants only such as never acquire a woody stem, as for example the *mesembryanthemums, euphorbias, crassulas,* and *cacti,* and the many *greenhouse* and outdoor *tender* plants that answer the description.

Applications for Permits.—An application for a permit must be in writing to the Division of Entomology, and state, in addition to any other particulars that the Department may ask for, (*a*) the full name, residence, and postal address of the applicant; (*b*) the name and address of the person from whom it is proposed to obtain the plants; (*c*) the botanical names or the generally accepted popular names of the plants, and the number of each kind; and also the varietal names and the number of each variety in the case of all plants for which permits are only given for limited numbers; (*d*) the channel of introduction, whether by post or otherwise, and if not by post, the port of entry at which the introduction is contemplated.

A permit will always be given in response to an application with respect to plants that have arrived in South Africa, provided one would have been given had the application for it been made prior to their having been dispatched from oversea; but to obviate avoidable detention of the plants on arrival, and to obviate the exclusion of any by reason of it not being possible to grant a permit for them, it is always advisable to make sure of a permit before an order is placed.

Potatoes.—Special restrictions apply to the introduction of potatoes from oversea and from non-British parts of South Africa, and on request to the Division of Entomology full particulars of these restrictions will be sent to any party interested. Any package in which pathogenic bacterial disease is found will not be admitted. The admittance of a consignment is conditional on the submission of a sworn statement by the consignor, in which he declares the country and the particular place or places thereof in which the potatoes were grown, and gives data clearly identifying the consignment; and further, except in the case of consignments from France, Belgium, Denmark, British East Africa, and Western Australia, on furnishing a certificate from a recognized official institution of the country of origin in which the fungus malady Black Scab or Warty Disease is certified not to have existed either in the district of origin or else within five miles of the actual place of origin.

Inspection and Fumigation.—All plants introduced into the Union are subject to inspection on arrival; and if at the examination any plant is found to be infected with an insect pest or plant disease, the Department of Agriculture may cause it, together with its receptacle and all articles therein, to be destroyed. Plants that arrive by post are examined by the plant inspector at the port where landed, or by a plant inspector elsewhere, according to the post office arrangements for the dispatch of oversea parcels to the place of destination. Plants that arrive as cargo or that are brought by passengers are ordinarily examined at the port of arrival, but any for Johannesburg or Pretoria may be allowed to proceed there for inspection.

It is not usual to destroy plants because of a slight infestation by any pest that is already widespread in the Union, it being customary to admit them after careful disinfection. Fruit is rejected if it is much infested with Fruit Fly, Codling-moth, or any other pulp-infesting insect, and is fumigated if it is infested to more than a trifling extent with any scale pest or fungus disease.

The consignee, if called upon to do so by the examining officer, is under obligation to certify in writing the name and address of the consignor, the names, quantities, varieties, and grade marks of the articles, the place of origin, and certain other particulars respecting the consignment, and also to open the coverings and to afford the officer every facility for conducting the examination. Any article to which a false or misleading name or description is given is liable to confiscation, and the party responsible for a materially false certification to conviction for an offence.

The Department is empowered to have any plant, as also its packing material and coverings, " disinfected or otherwise treated "; and in the ordinary course all *woody* plants are fumigated with hydrocyanic acid gas as a precautionary measure. Cotton seed is also subjected to fumigation. The consignee must pay for any treatment the fees and charges that are fixed by regulation.

Fees.—Fumigation and sorting fees are the only special expenses, apart from conveyance charges in the case of consignments that have to go to Johannesburg or Pretoria for inspection, that the Government levies in connection with the importation of plants.

The fumigation fees are as follow in respect of the several classes of plants:—

Vines, trees (except fruit-tree stocks), *roses, ornamental plants,* and plants not otherwise provided for: Two shillings and sixpence per hundred or part thereof, but not less than one shilling for each separate package.

Fruit-tree stocks, unrooted cuttings, and *strawberry plants:* Two shillings and sixpence per hundred or part thereof, with a maximum of five shillings per thousand and a minimum of one shilling for each separate package.

Fruit: Sixpence per package, with a minimum of two shillings and sixpence.

Sorting is rarely required, but where carried out the fees must be as follows:—

Fruit and *vegetables* (other than potatoes): One shilling per barrel, ninepence per half-barrel, and sixpence per box or basket.

Beeswax and Foundation Comb.—Foundation comb may be introduced into the Union by permit, which will be granted on the sworn declaration of the supplier that the wax from which the foundation comb was prepared was heated to a temperature of 212° F. for half an hour. Pure white beeswax, *cera alba,* will be admitted without any declaration and without being subjected to heating, but other beeswax must be accompanied by the sworn declaration referred to; failing this it will be subject to the required heating on arrival unless other arrangements are made with the Department.

CONTROLLING INTERNAL TRADE IN PLANTS.

The foregoing relates to the importation of plants, and as most of the troublesome insect pests and plant diseases now found in the Union have been introduced, this part of the Division's activities are of first importance. In order, however, to minimize the spread of certain pests and diseases now present, various regulations have been issued governing the local traffic in plants and fruit. Areas of the Union known to be free of certain pests and diseases were protected in that fruit and plants liable to carry infection were not permitted to be sent to them, while from infected areas again these were not permitted to be removed. Vine diseases and codling-moth were the two evils most guarded against, but notwithstanding the precautions it was possible to take, the latter pest gradually spread, and recently all restrictions in respect to it were removed. Owing to the recent discovery of wart disease of potatoes, the removal from certain places in the Impendhle District, Natal, of potato tubers and plants is prohibited.

The trade in plants, the chief source of spreading insect pests, is in the hands of registered nurserymen, and under the direct supervision of the Division of Entomology. Trade is only permitted under certain precautions and restrictions. Private interchange of plants is comparatively small, but all consignments sent by post and rail are subjected to inspection by the Department at certain centres in the Union, and the postal and railway authorities co-operate with it in carrying out these restrictions.

THE LOCAL PLANT NURSERY TRADE.

As stated above, the trade in plants (which, of course, includes trees) is in the hands of nurserymen. The requirements arising out of the Act and its regulations concerning the growing and disposal of nursery stock are carefully observed by nurserymen. All nurseries are registered and subject to systematic inspection by the Department, and where insect pests or plant diseases are discovered these nurseries, or the portions affected, are liable to quarantine. Adequate fumigation-chambers must be provided and maintained in connection with each nursery dealing in fruit trees, and stock is fumigated as required by regulation.

Railway and postal authorities are instructed not to accept any consignment of nursery stock for direct delivery unless it is accompanied by the certificate required by the regulations.

Thus nurserymen, railway, postal, and agricultural department officials work in close co-operation in preventing the spread of injurious insect pests and plant diseases, and the public in their dealings with them will receive all necessary advice in regard to the requirements of the Act and its regulations so far as local traffic is concerned.

NOTE.—Those desirous of studying the full text of the laws principally concerned should obtain Acts Nos. 11 of 1911, 10 of 1919, and 12 of 1922; also Proclamations Nos. 35, 36, 148 (1912), 229 (1913), 125, 144 (1916), 33 (1920), 18, 101, 119 (1921), 65 (1922), and Government Notices Nos. 366, 367, 1021 (1912), 210 (1913), 414 (1917), 10 (1919), and 506 (1920).

CITRUS CANKER ERADICATION.

INSPECTION WORK, AUGUST, 1922.

Farms Inspected—

Rustenburg District (Hex River Ward).—**Buffelspoort No. 668, Buffelsfontein No. 558, Boschfontein No. 381, Bokfontein No. 647, Kafferskraal No. 915, Rietfontein No. 431, Waterkloof No. 4, Rustenburg, Zuurplaats No. 822.**

Pretoria District (Crocodile River Ward).—**De Kroon No. 420, Roode Kopjies No. 44.**

Waterberg (Nylstroom Ward).—**Roodepoort No. 2148, Nylstroom.**

***Fresh Infections*.—Nil.**

***Fresh Outbreaks*.—Nil.**

***Total Number Inspected*—**

Nursery trees, 10,561; trees other than nursery, 7,532; trees found infected, nil.

Number of inspectors engaged, 21.

ARSENICAL SPRAY EXPERIMENTS FOR CONTROLLING CODLING-MOTH IN PEARS AT ELSENBURG.

By F. W. PETTEY, Ph.D., Entomologist, Elsenburg School of Agriculture and Experiment Station, Mulders Vlei, Cape.

INTRODUCTION.

EXPERIMENTS in the control of codling-moth have been in progress several years for considering (*a*) the practicability of substituting power dusting for spraying in the control of codling-moth, (*b*) the advisability of substituting calcium arsenate, a cheaper arsenical, for lead arsenate, in the control of this pest, (*c*) the more effective control of codling-moth by the addition of a calcium caseinate spreader to the lead arsenate and water mixture, and (*d*) the influence of lime-sulphur and bordeaux mixture on the efficiency of lead arsenate in the control of this insect. The experiments concerning power dusting are discussed in a separate article.

SEASONAL HISTORY RECORDS.

Records of the emergence of 2242 spring brood moths were taken at Elsenburg in 1921. The earliest spring adult moths appeared 24th September, at the time when Kieffer and Forelle pears were in full bloom, when the Louise Bonne pears were beginning, and three days after the Duchesse trees began to blossom. Since the weather was considerably warmer in 1921 than in 1920, during the first two weeks of October, eggs began to hatch in the orchard the second week of October, but comparatively few hatched until the first seven days of November, when the temperature was very high.

By the 1st of November, the time when considerable first brood eggs were hatching, all pears and apple varieties had received at least one application of arsenical spray, all pears had dropped their petals, and Ohenimuri and Versveld apples were still in blossom, but had dropped about two-thirds of their petals. It is interesting to note that in 1920, the earliest spring moths began to emerge 8th September, sixteen days earlier than in 1921, at the time Kieffer pears were in full blossom just as in 1921, but many weeks earlier than the time when apples dropped their petals. Even though the first spring moths emerged considerably earlier in 1920 than in 1921, their eggs did not begin to hatch until the end of the first week in October, the incubation period being prolonged by the continued cool weather three weeks before apples began to blossom, and as much as seven weeks before the Ohenimuri and Versveld apples had dropped their petals. Consequently, while in 1920, the apples which blossomed exceptionally late, escaped a great majority of the first brood larvae, they were exposed to most of the first brood hatching larvae in 1921. This

explains the exceptional freedom of these varieties of apples from codling-moth infestation in the Elsenburg orchard in the 1921 crop, and shows that the seasonal life history varies from year to year, and that the relation between the time of blossoming and time of hatching of first brood eggs is not constant.

As the maximum emergence of spring moths in 1921 occurred during the first five days of November in 1921, the maximum hatching of first brood larvae occurred from the 5th to the 10th of November. A spray to be correctly timed should then have been applied the first week of November. In 1921 the earliest first brood larvae appeared in the bands on 15th November; in 1920, 16th November, notwithstanding the fact that the earliest spring moths appeared considerably later in 1921. The earliest adult moths of the first brood emerged at the same time both years, i.e. 5th December. Consequently the correct time for applying the third codling spray was during the week of 15th December, or before Christmas, at the latest, to poison the earliest hatching second brood larvae.

EQUIPMENT FOR SPRAYING.

A petrol power sprayer of 1½ horse-power, capable of maintaining a pressure of 150 to 200 lb. was used in the experiments. It was equipped with two spray rods, each with a line of hose and a single-angled nozzle, furnishing a whirling spray through a flat disc, with an opening of medium size. The top branches of trees higher than 12 feet were sprayed from a tower.

GENERAL ARRANGEMENT OF SPRAY PLOTS.

All spray plots consisted of at least three rows of fruit trees, and those trees selected for records occupied the middle row of each plot. Trees dusted, those sprayed with calcium arsenate, and ten unsprayed check trees were banded for trapping larvae, to avoid as much infestation as possible in neighbouring plots.

THE EFFICIENCY OF CALCIUM ARSENATE IN CODLING CONTROL.

Regardless of the fact that several scientists have reported that calcium arsenate is at least as efficient as lead arsenate in the control of this insect (1)*, the writer has experienced results for two seasons that show the two brands used were decidedly inferior to the latter. Trees sprayed with calcium arsenate produced from 10 to 33 per cent. more wormy fruit than those sprayed with lead arsenate.

In the 1920-21 season an imported tricalcium brand from a well-known manufacturer was used at the rate of ¾ lb. plus 3 lb. of unslaked lime in 40 gallons (imperial) of water. In the 1921-22 season a different well-known imported tricalcium brand was tested at the rate of 1 lb. plus 1 lb. lime in 40 gallons of water. The material used in 1920-21 was obtained direct from the makers, and was manufactured in 1919 or early in 1920. It was very fine in texture. The material used in 1921-22, obtained from a local dealer, and said to have been made in 1919, was noticeably coarser in texture than the lead arsenate powder, had powers of suspension in water

* NOTE.—Numerals in parentheses indicate references to literature at end of article.

inferior to the lead arsenate, and failed to adhere well to foliage and fruit. A later manufactured improved material may possibly give better results. No burning of foliage or fruit was experienced.

Calcium arsenate is somewhat cheaper than lead arsenate, pound for pound, and when used at the rate of ¾ lb. in 40 imperial gallons of water, is considerably cheaper than lead arsenate as a spray. In Nova Scotia it is said to be used in the orchard districts almost to the exclusion of lead arsenate. It is extensively used in the southern part of the United States as a dust for the control of cotton insects. Before it can be recommended to the fruit grower in South Africa, much better results under South African conditions must be obtained.

THE INFLUENCE OF LIME-SULPHUR AND BORDEAUX MIXTURE ON THE EFFICIENCY OF LEAD ARSENATE.

Battail, a French scientist, in a paper on "The Causes which affect the Toxicity of Arsenicals employed in Agriculture," states: "The addition of these arsenicals to bordeaux mixture with the idea of producing a combination spray against both insects and mildew, reduces the effectiveness of the arsenicals by 50 per cent., and it is a matter of common complaint that these mixed sprays are not effective." (2) Sanders, of Canada, (3) states: "Lime-sulphur reduces the killing value of arsenical poisons by 20 per cent.; bordeaux by 44 per cent." Robinson of the United States (4) states: "When lime-sulphur is mixed with the acid form of lead arsenate (the form that must be used for satisfactory control of codling), the efficiency of the spray is decreased by about 35 per cent."

The results of experiments carried out at Elsenburg for the last two years to determine this question, clearly indicate that neither lime-sulphur nor bordeaux, when used as a combination spray with lead arsenate, at the concentration usually advised, destroy the efficiency of lead arsenate in codling-control any more than from 1 to 5 per cent. It appears that an increase from 1¼ lb. of lead arsenate powder to 1½ lb. in 40 imperial gallons of water prevents slightly the influence of the fungicides on the efficiency of lead arsenate, but not sufficiently to warrant this increase in concentration. The fruit grower is therefore advised to continue using a fungicide with lead arsenate, when circumstances warrant its employment, and at no less concentration than 1¼ lb. of lead arsenate powder or 2½ lb. of paste in 40 imperial gallons of diluted bordeaux or lime sulphur. A weaker solution than this would not give as satisfactory control of the insect according to results obtained in 1919-20 (5).

THE INFLUENCE OF CALCIUM CASEINATE SPREADER ON THE EFFICIENCY OF LEAD ARSENATE.

Many attempts have been made by scientists to improve the spreading of common insecticides and fungicides in water over foliage and fruit, as well as the ability of such solutions to stick to the surface. Lead arsenate is not an ideal insecticide in several respects. It does not remain in suspension in water very long, and therefore must be constantly stirred in the spray tank during spraying operations. This is a serious failing in South Africa, where many hand-pumps are used, which necessitates constant watching of the native

to see that he constantly stirs the liquid. Lead arsenate does not spread over the surface of the fruit sufficiently uniformly to make so complete a covering that every codling larva which attempts to enter the fruit is poisoned. It is likely to form concentrated blotches on the surface of both leaves and fruit, making it undesirably conspicuous on the fruit at the time the crop is harvested.

Lovett of Oregon (6) has recently investigated the most practical spreaders that may be used with lead arsenate, and has determined that the most desirable in respect to cheapness, availability, compatibility, efficiency, and ease in preparation, in order of merit, are calcium caseinate, glue, soap bark, and oil emulsion.

Calcium caseinate, used in the Elsenburg experiments, was made according to Lovett's formula, by mixing thoroughly 1 lb. of fine hydrated lime with 5 lb. of fine casein, obtained from the Aliwal North creamery. A half-pound of the mixture was added slowly to each 40 gallons of diluted lead arsenate in the spray tank, while being vigorously stirred. A soapy solution resulted.

Although the material appeared to spread well, forming a more uniform covering over the surface of the fruit than a solution of lead arsenate and water only, results show that this spreader had practically no influence on the efficiency of lead arsenate in the control of codling moth. Investigations of the effects of spreaders on the control of codling will be continued next season with the object of improving the qualities of lead arsenate in water for the more effective control of this insect.

ACKNOWLEDGMENTS.

The writer desires to acknowledge the valuable suggestions given by the Chief, Division of Entomology, in these experiments, and the assistance of the horticulturist with reference to the use of the orchard and spray machinery.

LITERATURE CITED.

(1) (*a*) "Origin and Present Use of Some Insecticides and Fungicides," by Sanders & Kelsall, in Proc. Nov. Scotia, Entomological Society for 1918, No. 4, p. 69. (*b*) Quaintance, in Farmers' Bull. No. 908, U.S.D.A., 1918. (*c*) Lovett in Oregon Bull. No. 169, 1920.

(2) "Des Causes qui influent sur la Nocivité des Arsenicaux employés en Agriculture." Progres Agric. Vitic. Montpellier, LXV, No. 19, 1916, pp. 448-452.

(3) *Canadian Hort.*, XLI, March 1918.

(4) "The Beneficial Action of Lime in Lime-sulphur and Lead-arsenate Combination Spray," by Robinson in *Jl. Ec. Ent.*, XII, No. 6, December, 1919.

(5) "How the Fruit Grower may more effectively control Codling-moth," by F. W. Pettey, *Journal of the Department of Agriculture*, S.A., October, 1921.

(6) "Insecticide Investigations," by Lovett, in Oregon Agr. Exp. Sta. Bull. No. 169, 1920.

PLANT DISEASES IN THE WESTERN PROVINCE.

VI.

Notes by V. A. PUTTERILL, M.A., Division of Botany.

WOOD-DESTROYING FUNGI IN THE ORCHARD.

THE interest taken in any fungus by people not directly concerned with a study of plants of this group depends almost entirely on whether it happens to be one of the large showy kinds such as mushrooms and toadstools or the amount of damage it does to living plants, timber, and foodstuffs, if it happens to be one of the microscopic fungi. Belonging to the same group as do toadstools and mushrooms, namely, the group of fleshy fungi, there are a large number which live on the wood of trees, either on living trees or on dead stumps or timber. Those which are able to attack living trees are called *parasites* (from the Greek word meaning one who lives at another's expense); those which can live only on dead wood are called *saprophytes* (plants which live on dead organic matter).

Some parasites are not able to live apart from the living host plant, others are able to live saprophytically as well. Some can enter the host without difficulty, others are wound parasites, that is, they can only gain a footing into the host plant when the latter is injured.

Of the fleshy fungi which live on living trees some are of striking appearance. For instance, in the Western Province a large, handsome, bright sulphur yellow fungus, *Polyporus sulphureus*, is very common on oak trees, and can be seen every winter for that matter in the Government Avenue, Capetown. Others, however, are not nearly as evident, and ordinarily are only noticed when actually they are being looked for. Of these perhaps one of the most common in the west, is one known botanically as *Schizophyllum commune*, a small bracket or fan-shaped fungus (Plate I, see figs. 1 and 2), about half an inch wide, greyish white and hairy on the upper surface and bearing purplish or mauve gills on the under side. It is on these gills that the spores are produced by which means the fungus is disseminated. The individual spores are oval bodies and very small, being only about one five-thousandth of an inch in length; they are produced in countless numbers as can easily be demonstrated by placing one of the brackets of *Schizophyllum* on black paper and covering with a dish of some sort, and making provision that the air inside the dish is kept moist. After twenty-four hours a white spore print of the gills will be seen to have been produced.

Schizophyllum commune occurs on a great number of different plants, and is common too on dead wood such as stumps, fencing posts, logs of wood, and so on. It is a very common occurrence too in orchards, on living fruit trees, and also on dead branches. Stone fruit trees such as apricots, peaches, and prunes seem to be most commonly affected. It was on this account that the author carried out an investigation on this fungus (published elsewhere*) with the

*The Biology of *Schizophyllum commune* Fr., with special reference to its parasitism, by V. A. Putterill, M.A., Division of Botany, Union Department of Agriculture, Science Bulletin No. 25. Obtainable from this office. Price 3d. prepaid.

PLATE I

Fig. 1

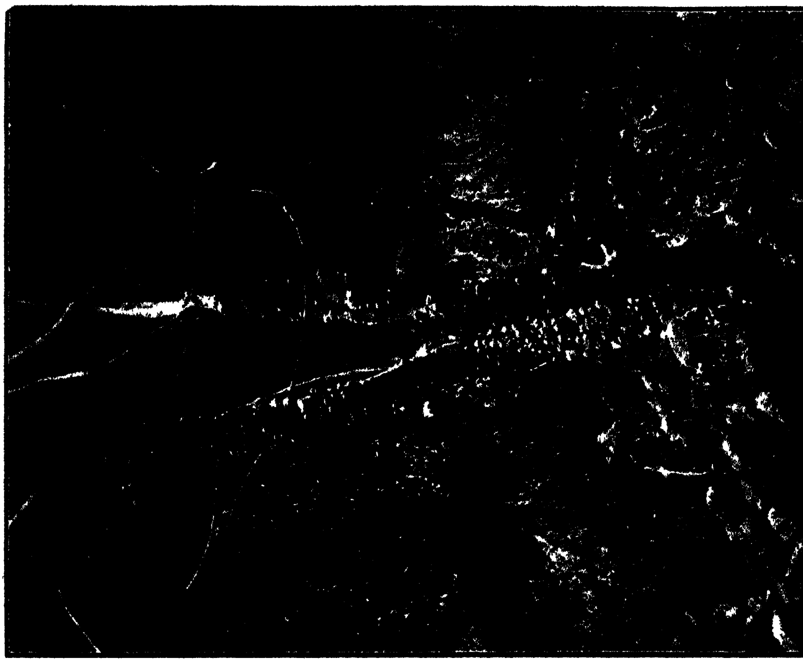


Fig 2

object in view of trying to find out more about its mode of life, and whether it might be considered a true parasite or not.

An examination of the wood of an apricot tree attacked by *Schizophyllum commune* showed the presence in the tissues of the threads of the fungus (see fig. 5); the wood is discoloured and the vessels of the wood become clogged up with gum. The wood is rendered very brittle, but the rot is not a "soft" one as in the case of some wood rotting fungi. Plate II, figure 3, is a photograph of a plum branch showing a similar kind of discoloration, though not caused by *Schizophyllum commune*, in this case; and figure 4 a "soft rot" of a living peach branch caused by a different fungus.

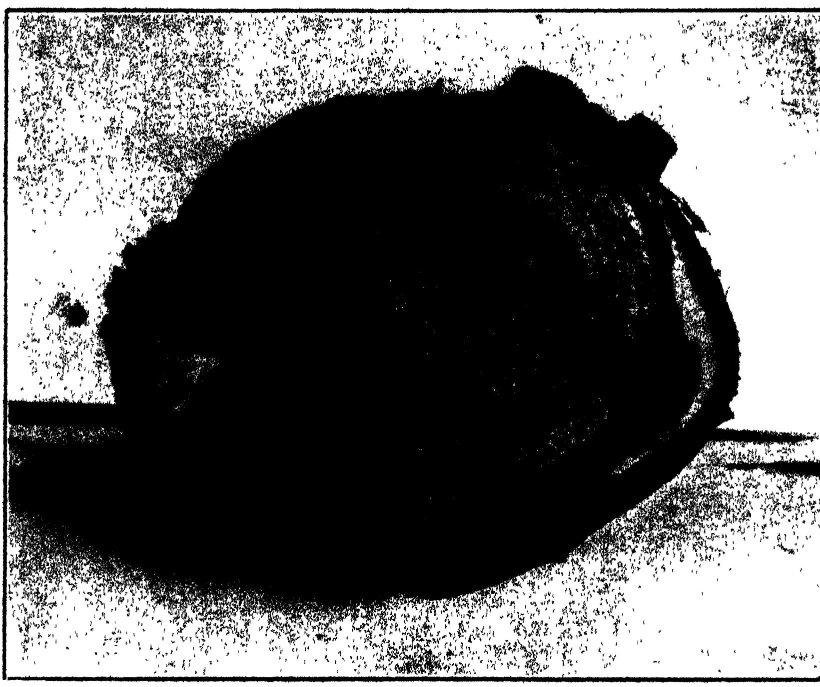


PLATE II.—FIG. 3.—Section of a plum tree branch showing discoloration of the wood due to the growth of one of the wood destroying fungi. The leaves of this branch were *silvered*, which points to the fungus in this case being one known as *Stereum purpureum*.

[*Photo: V. A. Putterill.*

Schizophyllum in process of growing and spreading in the affected tissues produces substances known as *enzymes*, similar to the digestive juices in animals; one enzyme enables the fungus to dissolve the cellulose constituent of the wood, another to dissolve any starch grains in the cells into certain sugars; another to render fatty substances assimilable, and so on.

Schizophyllum commune is particularly resistant to drying; experiments are on record which prove that dried fruit bodies retain their vitality for at least five and a half years when kept at room temperature; moreover, fruit bodies remained alive for more than

sixteen months when kept in a vacuum, nor did exposing thoroughly dried ones to a temperature of liquid air for three weeks kill them.

Inoculation experiments carried out by inserting portions of artificially grown *Schizophyllum commune* into holes made in peach and apricot branches proved that the fungus is able to grow in living wood, that is, that it is a parasite though its growth is not rapid. However, the fact that it is not rapid is no excuse for neglect. Most wood-destroying fungi are comparatively slow in their action, and it is because of the insidiousness of their growth that they are often neglected, or rather, perhaps, not noticed, until it is too late. In fact, a branch which may be rotten to the core, may nevertheless still appear to be fairly healthy.

PLATE II.—FIG. 4.—Peach branch in section showing a soft rot of the wood due to one of the wood-rotting fungi.

[*Photo: V. A. Putterill.*

The fungus which causes silver leaf of fruit trees is somewhat like *Schizophyllum commune* in its mode of growth in the wood, but it is a much more active parasite, and it causes first this silvering of the foliage and subsequently the death of the affected branch or tree. The discolouration of the wood as a result of this fungus is similar to that caused by *Schizophyllum commune;* in fact figure 3 of Plate II is a photograph of a branch of a tree affected with silver leaf.

No time spent in protecting a tree of any value from the attacks of such wood-rotting fungi is time wasted. And it is to prevention rather than to cure that the greatest good can be looked for. Wounds, whatever the cause, should be cleaned, rough or torn edges of bark

cut neatly away, and painted over with tar or some other such substance. Such covering should be renewed at intervals until the wound has healed. Branches known to be diseased should be cut back *to healthy wood*, and burnt, and the resulting wound painted over.

Any condition of soil or climate which tends to weaken a tree is liable to make it more susceptible to such fungus attack. Therefore, it is most essential that every care be taken towards keeping one's

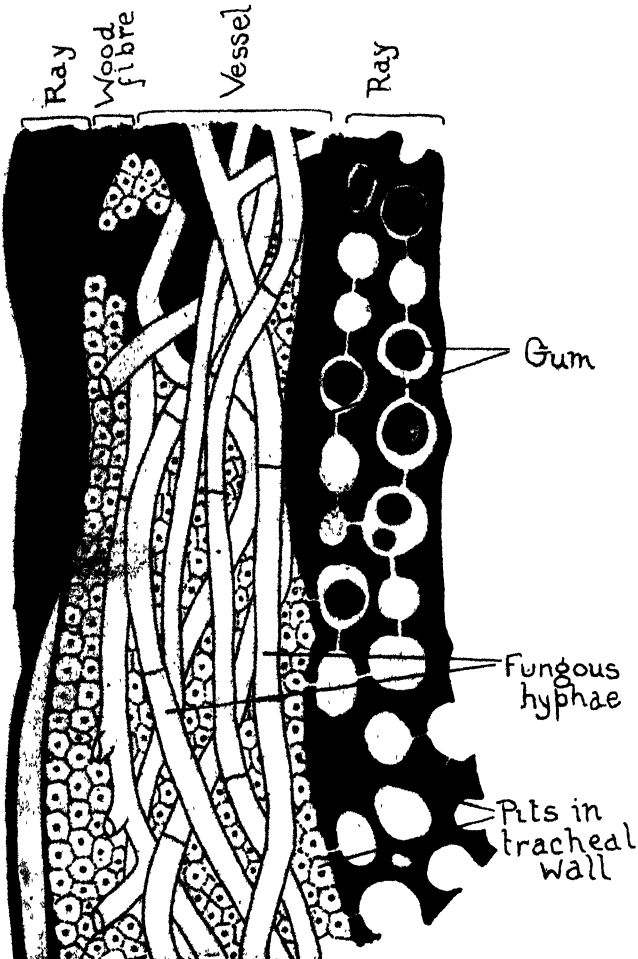


FIG. 5.—Camera lucida drawing of a longitudinal section of diseased apricot wood showing hyphae of *Schizophyllum commune* in the vessels and a certain amount of gumming. × 1100.

trees in the best of condition. Lime is characteristically deficient in the Western Province soils, and every fruitgrower should make it his business to see that this deficiency is made good, as a lack of lime seems to be a common predisposing cause towards successful attacks by wood-rotting fungi.

INQUIRIES AND REPLIES.

SELECTED LETTERS FROM FARMERS.

[Hereunder are a number of recent letters replied to by the various Divisions and Schools of Agriculture concerned. They are selected for publication as being of interest to farmers generally in the localities affected. In each case the area only from which the inquiry emanates is given; as the replies must necessarily be curtailed, they will indicate, when required, literature from which further information may be had. All departmental bulletins quoted are obtainable on application to the Editor.]

Cotton-seed Meal.

Swaziland.—(1) What is the analysis of cotton seed (undelinted) ground with the husk on (oil not extracted). (2) Would this meal be a suitable feed for cattle? (3) What should be mixed with it to form a complete ration? Could mealie bran form one of the components? Could the meal be fed alone in small quantities to cattle that are grazing all day? (4) What could a farmer afford to pay for it in order to make a profit by feeding it to his cattle? (5) Is this meal suitable as a feed for all animals, with the exception of pigs? (6) What is its value as a fertilizer as compared with a cattle feed?

The Chief, Division of Tobacco and Cotton, replies:—

(1) Analysis of Rustenburg cotton seed:—Water, 5.03 per cent.; ash, 3.50 per cent.; protein, 24.33 per cent.; crude fibre, 23.28 per cent.; nitrogen fibre, 23.39 per cent.; fat, 20.47 per cent.

(2) The meal would be better with the oil extracted, as the oil is a laxative and is excessive; feed in conjunction with maize meal, forage, or ensilage. Begin with about 2 lb. per day of cotton-seed meal and gradually increase up to 5 or 6 lb.

(3) Mix with mealie meal or bran; feed in addition to plenty of grazing, or forage, or ensilage.

(4) It would be cheap at £6 per ton, and is good for either milk cows or for beef.

(5) It is not good for young calves or pigs, as there appears to be a toxic poisoning for them.

(6) It is more valuable as a feed than as a fertilizer, as the latter use would be wasteful. Its fertilizing constituents are as follows:—Ash, 3.78 per cent.; nitrogen, 3.13 per cent.; phosphates, 1.27 per cent.; potash, 1.17 per cent.; lime, 0.25 per cent.; magnesia, 0.55 per cent.

1 lb. cotton seed is equal to 1.13 lb. mealies or mealie meal.

1 lb. cotton seed (oil extracted) is equal to 1.75 lb. mealies or mealie meal.

1 lb. cotton seed (oil extracted) is equal to 1.50 lb. cotton seed.

1 lb. seed hulls is equal to ½ to ⅔rds of grass hay.

Cotton Growing.

Ntambanana, Zululand.—Kindly advise me on the following points relative to cotton. The altitude averages about 1000 feet, and the rainfall between 26 and 30 inches per annum. (1) What variety of cotton would you recommend for this locality? (2) How does the length of staple of the variety you would recommend compare with other varieties? (3) Is this variety in demand by the spinners, and what facilities exist for the disposal of a fairly large parcel? (4) Do you know where seed may be obtained (about 5000 lb.), and at what price? (5) What would be the most suitable time to plant?

The Chief, Tobacco and Cotton Division, replies:—The altitude and rainfall both seem very satisfactory for the production of cotton. (1) I should not like to say which variety will be best suited to your locality, but the names of two or three varieties, in the order of probable merit, are: Zululand Hybrid, Griffin, Watt's Long Staple, Improved Bancroft. (2) These varieties should give you a staple ranging between $1^1/_{16}$ to $1^3/_{16}$ inch in length. (3) A staple of this length would be in fairly strong demand at all times. If there should be no purchaser in this country for your crop, you could have it ginned and shipped to the British or European markets, where there is always a demand. (4) Seed of the above-mentioned varieties may be obtained from the following addresses:—Zululand Hybrid from E. Loffer, Nongoma, Zululand; Griffin from the Manager, N'Ksini Estates, Weenen, Natal; Watt's Long Staple and Improved Bancroft by communicating with the Tobacco and Cotton Expert, Barberton. The prices of any of this seed will range from 3d. to 6d. per lb. I am not sure that you will get the amount you require except of Griffin, of which you can get as much as you wish at 4d. per lb., with a 10 per cent. discount, cash with order. (5) The most suitable time to plant is October or November, as soon as the spring rains set in.

Moisture Control in Stored Maize.

Elim Hospital, Northern Transvaal.—What is the average humidity left in the grain, say, at the end of October? What quantity and strength unslaked lime must be used to absorb the moisture, considering that good, unslaked lime is not easily procurable here?

Potchefstroom School of Agriculture replies:—By the end of October, unless there have been rains, the maize should not contain more than 8.5 per cent. to 9.5 per cent. of moisture. Tests made on several varieties showed the minimum moisture content to be reached about the end of August. As soon as the rainy season starts, the moisture content increases again. There is no danger in putting maize with such a moisture content into tanks—without quicklime. A moisture content above 12.5 per cent. is considered dangerous.

As good unslaked lime is not easily procured, two to four pounds 50 to 75 per cent. calcium-oxide variety should be quite sufficient for every 100 lb. of grain. If spread in open boxes, a few inches deep, it would do more good than in double bags.

Pineapple Export.

East London.—What are the prospects for pineapple export, how should the fruit be packed, where are boxes obtainable, etc.?

The Chief, Division of Horticulture replies: Pineapples exported at present are not realizing very high prices, but it is considered that the prospects are good. The South African Queen pine has still to be known on the European market to be appreciated at its full value. While it is not absolutely necessary to place pines in cold storage before shipment, this is recommended when it would precool the fruit and put it on board as near perfect condition as possible. To be in the best condition for export, pines should be packed when they are at least 65 per cent. ripe, i.e. they should be fairly well coloured, and show no sign of verdant greenness. The sizes of all boxes are given in the Fruit Export Regulations. Boxes manufactured locally from imported spruce, and comparing favourably with the imported box, are obtainable from timber merchants.

"Blown" Cheese.

Pretoria.—What is the cause of cheese "blowing" after it has been taken out of the press and placed on the curing shelves?

The Superintendent of Dairying replies: Assuming this is not due to the use of gassy milk, then it is the fault of the cheese-maker in the various stages of making which the cheese has to undergo. "Blown" cheese is nearly always due to insufficient cooking and drawing the whey off too soon, and, in some districts, also to the cooking temperature being too low. Cheese which is insufficiently cooked, and the whey drawn off too soon, retains too much whey or moisture, which any amount of pressing will not remove, consequently the excessive whey in the cheese ferments and forms gas, which in due course causes the cheese to heave or "blow": this also applies to cheddar cheese, and what is known as a weak-bodied cheese will act in a similar manner.

Spraying for Codling-Moth.

Oudtshoorn.—Please advise me what spray to use and when to start spraying pear trees

Grootfontein School of Agriculture replies: Pears usually suffer from codling-moth infestation. Begin to spray as soon as the petals start falling off. Repeat in fourteen days and again in twenty-one days. Two later sprayings at intervals of three weeks can be given. The poison used is arsenate of lead at the strength of 3 lb. to 50 gallons of water. A fair amount of force should be applied in spraying, and the little cup at the top end of the fruit should be filled with the poison, as this is the place where the larvae enter the fruit. Banding the trees can also be tried. Fallen fruit must be destroyed.

Yellowing of Orange Leaves.

Uitenhage.—The leaves of my orange trees are turning yellow and falling. What would cause this?

Grootfontein School of Agriculture replies: The yellowing of the leaves may be due to "brak," too much water, or to a combination of these two. An analysis of the soil may help to elucidate the question. Application should be made to the school for particulars regarding the conditions governing analysis of soils.

Separator.

Bedford, C.P.—I am commencing to supply cream and am milking ten cows daily. Do you think it worth my while to buy a separator for such a small amount of milk.

Grootfontein School of Agriculture replies: To obtain top price for your product it is very necessary for you to purchase a separator; otherwise, in obtaining your cream by hand-skimming you will waste a considerable portion of it, and also will never be able to produce a first-grade article under summer conditions.

The advantages of a separator over hand-skimming may be briefly stated as follows:—(1) Fewer utensils are required. (2) The skim milk is immediately available for stock-feeding in a fresh state. (3) The butter-fat content of the cream can be regulated. (4) Much less fat is lost in the skim milk.

The fat that you will save during the course of two seasons will more than pay the purchase price of a separator. In selecting your separator, remember that your herd will probably grow in size, so do not purchase a machine that will soon become too small for your requirements. I would suggest one that will separate from 45 to 60 gallons per hour.

Fruit-Fly Spray.

Imvani.—Please give me information with regard to the best spray against fruit-fly, and also the best time to start spraying.

Grootfontein School of Agriculture replies: Begin baiting for the fruit-fly about three weeks before fruit ripens and keep the trees baited till about three weeks after the fruit is off. Repeat baiting after every rain and at intervals of ten days in absence of rain. Also bait other kinds of trees surrounding orchard to kill mother flies. The bait is made as follows: —Arsenate of lead (50 per cent paste), 2 lb., or arsenate of lead (powder), 1 lb.; treacle (crude), 3 gallons, or sugar (cheapest), 25 lb.; water, 40 gallons. Mix the arsenate with a little water, and dissolve the sweetening agent in the remainder and stir in the arsenate. Make up fresh as required and stir when using. Use a garden syringe with a fine rose, and sprinkle bait in minute drops over foliage; one syringeful is usually enough for each tree. Fallen fruit must be destroyed.

Pullets going into Moult.

Zastron.—I have about thirty White Leghorns, and in May month they were laying well. About the middle of last month (we had a heavy fall of snow at the time) they went off the lay and about twelve of them started moulting—only the feathers on the head and about the neck coming out. I had got all of them through the moult in March and April. These twelve have got the new feathers coming without any difficulty, but I cannot account for them moulting again. They are well housed. I am feeding as usual, and the same since they started moulting in January. I killed one of the cockerels, and it was not fat, so they have not been overfed.

Glen School of Agriculture replies: There is little doubt that the partial moult was due to the very sudden change in the weather and the snow. Pullets just about on the point of laying, or that have just commenced to lay, are very sensitive and susceptible to partial moults if any unnatural or sudden change takes place in such matters as the weather, housing, feeding, or even a change of person giving them attention. It is doubtful whether these pullets will commence to lay before the spring. While, from an egg-producing point of view, this is disappointing, they probably will develop into bigger, more robust, and stronger birds for breeding purposes than those which continued to lay.

Destroying Locust Eggs by Ploughing.

Bloemfontein.—Kindly inform me whether ploughing is of any value in the destruction of locust eggs that have been deposited in cultivated lands.

Glen School of Agriculture replies: There is no doubt that this method will entail the destruction of some eggs by exposing them to the sun, predaceous and parasitic insects, birds, and other enemies; others will be buried deeply, and the young will perish when they hatch out.

American authors recommend deep ploughing as profitable, and state that it is effectual "according as the soil is porous or tenacious, and according as the surface is afterwards compressed by harrowing and rolling." If ploughing is delayed till spring it is said to be most effective if done just as the young begin to hatch.

Storing of Eggs.

Clocolan.—Kindly inform me how to store eggs so as to keep them fresh for three months or longer. The price paid for eggs being very low at present. I think it better to keep them till later.

Glen School of Agriculture replies: I should advise you to keep the eggs in waterglass, which is obtainable from any of the larger merchants. Directions are usually printed on the tin, and must be followed strictly, as different firms produce waterglass in different strengths.

Pigs : A Profitable Proposition.

Elandskop, Natal.—"Do you consider pigs a profitable proposition when weaners cost 15s. each, mealies are worth, say, 15s. on the farm, and pollards cost 8s. per 100 lb. plus railage and transport, whereas the bacon pig is worth 6d. per lb. delivered at the factory, with the risk of a pig or two being condemned for disease or failing to feed well."

Cedara School of Agriculture replies: "Pigs will condense maize to one-sixth its bulk: 200 lb. maize will give 33⅓ lb. pig at 6d. = 16s. 8d. Labour offset against manure; where grazing is available on forage crops, kitchen and garden refuse, the amount of concentrated food can be reduced by about half, and satisfactory gains made. If dairy by-products are available so much the better. There is risk in buying weaners. You may get them badly infested with worms, when they will not thrive. At 6d. per lb. live weight pigs are a paying proposition. They should be farm bred to ensure healthiness, freedom from measles and tuberculosis."

Artichokes.

Newcastle.—"How do you plant artichokes, and which is the most favourable soil for them, damp or dry?"

Cedara School of Agriculture replies: "Artichokes prefer a light to medium loam in order to grow to perfection. The soil should be moist, but not damp, as in this case the tubers are liable to rot in the ground. The method of planting is very similar to potatoes. The artichokes are set in rows three feet apart and two feet distant between each "seed." Four hundred to 500 lb. of tubers are required to plant an acre."

Fungoid Growth.

Pietermaritzburg.—"My citrus and deciduous trees are badly infested with fungoid growth as per specimens. The citrus tree, from which one specimen was cut, is approximately 16 years old, and is now nearly all dead. The larger specimen is from an apple tree, about six to seven years old, this tree also being in the last stages. Up to about three years ago the trees were regularly sprayed and were then clean and healthy. They have been entirely neglected the last few years. The trees which are entirely or nearly dead are the worst infested by the growth. There is also infestation by a smallish dark coloured ant, in the lower part of the stems, under dried out and dead bark."

Cedara School of Agriculture replies: "The growth submitted is a species of lichen. When very abundant, lichens, although non-parasitic, tend to strangle plants on which they are growing, and they also afford excellent shelter for injurious insects. Deciduous trees can be readily cleaned by applying a winter spray:—1 part concentrated lime-sulphur to 10 parts water. For citrus trees bordeaux mixture should be used. It is thought that the ants are not of importance, but it is possible that there are other factors affecting the health of the trees."

Hominy Chop and Brewers' Grains.

Natal Coast.—"What are the analyses of hominy chop and brewers' grains? Can you give me some idea of how to work out the monetary value of various foods on a unit basis?"

Cedara School of Agriculture replies: The average composition of the two foods to which you refer is as follows:—

	Moisture.	Crude Protein.	Crude Fat.	Crude Fibre.	Soluble Carbohydrates.	Ash.
Hominy Chop ...	10	10	7	6	64	3
Brewers' Grains	10	20	6	17	43	4

To value feeding stuffs is more complex than in the case of fertilizers, for there are factors, such as palatability, for example, which cannot be reduced to figures. The following formula gives a useful estimate in comparing prices of foods of a similar type. No. of food units per ton (crude protein + crude fat) × 2·3 + soluble carbohydrates. In the case of the above foods, the values would be:

Hominy Chop ... (10 + 7) × 2·3 + 64 = 103·1 food units.

Brewers' Grains . (20 + 6) × 2·3 + 43 = 102·8 food units.

This method should be worked out on the digestible constituents of the food instead of the total percentages to obtain more correct relative values. It also includes an allowance for the manurial value of the food. The relative cheapness of different feeding stuffs can readily be compared by dividing the price per ton by the number of food units, and so ascertaining the cost per food unit.

Cracking of Surface of Soil.

Inchanga.—"The soil of part of my mealie lands is of a very sandy nature, but contains some yellowish clay. I find that the surface cakes and cracks in dry weather, a condition gradually getting worse. I have manured with nitrate of soda for the past few years. Can you tell me the reason for this cracking of the surface and suggest a remedy?"

Cedara School of Agriculture replies: In nitrate of soda the essential constituent is nitrogen, which is taken up by the crop, leaving the soda in the form of the carbonate or hydrate (black alkali). The presence of this causes the clay to puddle easily, especially if worked when wet, and then to harden and crack on drying. The sand in your soil should help to prevent this, but possibly there is a lack of the intermediate silt particles in the soil, which would accentuate the effect of the clay. The remedy is to substitute ammonium sulphate for the nitrate of soda if a quick acting manure is desired, as it tends to increase the acidity of the soil and so counteracts the effect of the alkali. Liming will be found beneficial, especially if the humus content of the soil is first increased by green manuring or applications of kraal manure.

Mixing Fertilizers.

Inchanga.—Can I safely mix the following? What would be the resulting analysis, and would the mixture be suitable for mealies on a poor sandy soil? 2000 lb. blood meal (11·5 per cent. nitrogen), 500 lb. muriate of potash (60 per cent.), 2000 lb. superphosphate (water soluble phosphoric oxide 17·0, citric soluble phosphoric oxide 17·5; total phosphoric oxide 18·0 per cent.).

Cedara School of Agriculture replies: The mixture would have the following composition:—Nitrogen 5·1 per cent., potash 6·7 per cent., phosphoric oxide soluble in water 7·6 per cent., phosphoric oxide soluble in citric acid 7·8 per cent., total phosphoric oxide 8 per cent. This mixture would be suitable for the soil. For most crops and soil there is no choice between the sulphate and the muriate of potash, but it is usually considered that the sulphate is preferable for the potato and tobacco crops.

Wooden Stave Silos.

Rosetta.—"Would you advise the erection of a wooden stave silo on our farm at an altitude of 4500 feet? We fear shrinkage will be too great at such an altitude."

Cedara School of Agriculture replies: If it is a matter of freezing, I would say that freezing is just as likely to take place inside any other design of silo. Provision is made on all stave silos to take up shrinkage.

Anthrax Spore Vaccine.

Senekal.—Do you recommend the Australian Spore Vaccine? I notice it is advertised to keep cattle immune for life. I have always got my spore vaccine from you, and would like your advice.

The Director of Veterinary Education and Research replies: I regret that it is not possible for me to recommend the use of the Australian vaccine in preference to our own, for the simple reason that there is no evidence whatever to show that it is superior in any way to the spore vaccine prepared by this Division. What makes it impossible for me to recommend the use of any imported vaccine to our farmers, is that we have no control whatever over the preparation of such vaccines. Anthrax vaccine is made from living organisms, and hence the most careful control of each stage in its preparation is essential, if one wishes to be quite sure that it is safe for use and will produce the necessary immunity. Such control can only be exercised when one prepares the vaccine oneself, as is done in the case of our own spore vaccine. Our experience with the Australian vaccine is that it produces large swellings in some animals, particularly in horses, and that it is not safe to use in goats. The claim put forward that the Australian vaccine will protect animals for life cannot be taken seriously. We know from experience that the immunity set up by this vaccine and by our own will last only for about 9-12 months, and it is for this reason that we advise farmers to inoculate their stock running on infected farms at least once a year.

Use of Dried Meat as Poultry Feed.

Prieska.—I am sending you a sample of dried meat. What is its feeding value for poultry, and are there any methods of improving it?

Elsenburg School of Agriculture replies: The composition and feeding value of the sample is fairly good. In its present condition, however, it is of no use as a poultry feed. It would have to be ground to the condition of a meal. The two important points to note in making a feed of this kind are (*a*) thorough sterilization, which you would have to guarantee; (*b*) the material would have to be ground to a fine meal in order to compete with other meat meals on the market. At present a meat meal for poultry and pigs is obtainable in Capetown for £10 per ton. The sample of meat meals you submitted for examination is developing a slightly rancid smell, this being due to imperfect sterilization. A meat meal must be efficiently sterilized.

Use of Carbonate of Lime and Slaked Lime.

Ceres.—What quantity of carbonate of lime is it usual to apply when liming a soil, and if slaked lime is used would one use the same quantity?

Elsenburg School of Agriculture replies: It is usual to apply 1000 to 2000 lb. ground limestone per acre, but very much less slaked lime, unless one is working for purely experimental purposes. To apply carbonate of lime or slaked lime in absolutely equal proportion, 100 lb. of slaked lime would be equivalent to 135 lb. ground limestone, provided both are of equal purity. This, however, is not the usual practice.

Mealies as Feed for Horses and Mules.

Wellington, Cape Province.—Please advise me regarding the use of mealies for feeding my horses and mules. I have oats in plenty. Do you advise a mixture of mealies and oats? My horses and mules are about medium size.

Elsenburg School of Agriculture replies: The use of mealies in conjunction with oats for feeding both your mules and horses is recommended. It is not advisable to feed whole mealies, even though you soak them, as horses especially are apt to swallow them whole and suffer from colic. It is a safer and more profitable practice to crush mealies. Only in the case of foals, whose teeth are not fully developed, and old horses, whose teeth are badly worn, should mealie meal be fed, and even then only in small quantities—that is, not more than a couple of lb. per day when mixed with such feeds as bran and crushed oats. Your horses and mules would weigh about 800 lb. A mixture therefore of crushed mealies and whole oats in the proportion of 1-2, when they are doing light work, and in equal parts when at heavy work (e.g. ploughing), and at the rate of 8-10 lb. per head of this ration per day, together with a few lb. of oat-hay, will ordinarily meet their requirements. Naturally, if you have lucerne-hay on hand, it would be preferable to feed it to oat-hay. Read "Productive Horse Husbandry," by G. W. Gay.

Sunflower Silage.

Robertson.—Is the growing of sunflowers, where rainfall is limited, more profitable than mealies or even kaffir corn? My object is to convert the sunflowers into silage. About what quantity of seed is required to be sown per acre? Should the seed be soaked before sowing, and how far should the rows be apart, and what yield can be expected per acre?

Elsenburg School of Agriculture replies: The sunflower will thrive under the same climatic conditions as will sweet sorghums or kaffir corn, and will resist severer droughts than mealies. From a silage point of view it cannot be considered a more profitable crop to grow than either sweet sorghums or kaffir corn under the same conditions, for the quality of sorghum and kaffir corn silages is better and more palatable for dairy cattle than is sunflower silage. The former are cheaper to handle and produce a better product with less care. The yield per acre in each case is about the same, varying from 5-10 tons to the acre, according to climate, soil, manuring, and cultivation. Sunflower seed may be sown in drills 3 feet apart, and thinned out to about 12 inches in the rows; 5-8 lb. of seed will be required to plant an acre. Unless the moisture content of the soil is insufficient to give an even germination it will not be necessary to soak the seed before planting.

Mating of Young Gelts.

Oudtshoorn.—At what age should young gelts about five to six months of age be mated, and do you consider the practice of letting them all run with the boar at the same time a good one?

Elsenburg School of Agriculture replies: If your gelts are particularly well-grown, they could be mated at eight months of age, though in the majority of cases it would be wiser to hold them back until they are about ten months. In the case of gelts that one is desirous of developing for show purposes, it is invariably necessary to hold them back until they are twelve or even fourteen months of age. But this practice is not recommended, except where judicious feeding is practised, as the gelts will probably take on too high a degree of condition, in which case they are likely to become sterile. Ordinarily, it is not a good practice to run the boar with a lot of gelts and sows that are to be mated, and particularly is this true in the case of pure-bred stock. If this is done, a valuable boar's usefulness will be considerably shortened. It is a better practice, therefore, to observe carefully when your gelts come on heat, and to turn them out separately with the boar. When you notice the gelts in this condition—it may be that it is just the beginning of the oestral period—if only one service is then allowed, small litters are likely to be obtained. The best results are ordinarily secured if mating takes place when the gelts or sows have begun to go off. It is, however, recommended that you have your gelts served immediately you notice them come on, and then again the following morning. This practice has proved highly satisfactory at Elsenburg during the past few years.

Read the bulletin "Pigs and Piggeries." Price 3d. prepaid.

Ploughs Suitable for Braaking and Hillside Work.

Elgin.—I should be glad if you would kindly recommend to me what make of double-furrow plough should be used for braaking. Also I have quite a lot of hillside word to do, and I would like to know what plough I should get.

Elsenburg School of Agriculture replies: A useful double-furrow plough for braaking on clean land is one that will turn a furrow 8 in. by 12 in. for each plough bottom. For land covered with bush, and where deep ploughing is required, a single furrow is desirable capable of turning a furrow 9 in. by 15 in. when drawn by six good mules, and will do from 2-2½ acres per day.

For hillside work, a reversible mouldboard plough, or any similar type of plough, will prove satisfactory.

Sheep Shearing.—School of Agriculture, Glen, Orange Free State.

Outbreaks of Animal Diseases: August, 1922.

Disease.	Transvaal.	Natal.	Cape.	Orange Free State.	Transkei.	Totals for August, 1922.	Total, Calendar Year, 1921.
East Coast Fever	—	1	—	—	—	1	212
Mange	28	2	20	5	3	58	272
Anthrax	36	5	15	18	24	98	1557
Dourine	—	—	3	—	—	3	50
Glanders		—	—	—	—	—	8
Tuberculosis	—	—	—	—	—	—	10
Epizootic Lymphangitis	—	—	—	—	—	—	6

THE POULTRY YARD MONTH BY MONTH.

October.

By J. J. JORDAAN, Poultry Instructor, School of Agriculture, Glen, Orange Free State.

Incubation.—This is the last month of the year in which it is advisable to hatch chickens. Goslings, turkeys, and ducklings should be hatched, but young ones must have ample shade and dry sleeping quarters. Infertility and an over-large percentage of "dead in shell" may be accounted for, to a large extent, by the male bird being exhausted. Try replacing him with the reserve bird in the breeding pen.

Feeding.—See that all food and drinking vessels are kept scrupulously clean. Add just enough permanganate of potash to the drinking water to make it slightly pink in colour; heating and stimulating foods, such as mealies, kaffir corn, and barley, affect the liver, and should therefore be fed sparingly.

Chickens.—See that your small chicks are safe, and in no danger of being flooded out during the night. Dampness, chill, and sudden changes in the temperature are liable to set up white diarrhoea in small chicks.

Disease.—Look out for chicken-pox and roup, and on the first signs thereof take stringent measures. For chicken-pox isolate the sick bird at once. Give each of the other birds a sulphur pill the size of an ordinary bean. Spray the sleeping quarters, and, if possible, remove the birds to a fresh run. Give liberal supply of green food. The sick bird should feed on soft food and greens, and have the sulphur pill and also a dose of epsom salts: one teaspoonful to a tablespoonful of water is the dose for all adult birds; young birds in proportion. Wash the face and head or affected part with a strong solution of permaganate of potash; break off the crust from the wart and drop in one or two permanganate crystals, or wash head and face, etc., with a mixture of equal parts vinegar and water, and rub on carbolic vaseline. Painting the warts with tincture of iodine each morning or evening effects a speedy cure. In two or three days the bird is usually fit to be returned to the run.

The treatment in regard to roup is similar as regards feeding and isolation. In addition, night and morning give the sick bird one-grain tabloid of ammoniated quinine; wipe the face and nostrils with an old rag and wash with sulphate of copper solution (one ounce dissolved in a pint of water). If it does not recover by this treatment in four or five days, then destroy it.

Export of Eggs.—In connection with this trade, export only the most desirable quality of article. Therefore, dispose of all roosters not wanted for breeding purposes, or pen them up at once, and fatten for the table poultry section. Produce unfertile eggs, feed clean, wholesome food, and provide ample clean water for the birds. See that the nests, the egg collectors' hands, and the receptacles are clean. Keep all eggs until dispatched in a clean, cool store. Pack in sound, clean, and light egg-boxes, not straw, chaff, bran-litters, or such like material, when sending to market or depot, and mark very clearly the contents of the package. Dispatch the eggs regularly and as frequently as possible.

Poultry Export.—Our export trade is opening for good, young, fat table poultry. The writer is of opinion that there are equally good, if not better, possibilities to those of the egg trade. To produce the right article, mate correctly; rear by feeding so as to produce frame and flesh early; keep the birds growing; finish them off by correct feeding and treatment before sending them to the buyer or exporter; do not overcrowd in dispatching; do not become discouraged if the first attempt is not a glowing success.

For detailed advice on any of the above points, breeders should write to the poultry instructor at the Agricultural School serving the Province in which they are resident.

NOTE FROM THE CEDARA SCHOOL OF AGRICULTURE.

Chick Feeding.—Last month the feeding of chicks from hatching to three weeks of age was dealt with. The following menu is recommended for chicks from *three to six weeks old*:—

Dry Mash (by measure): 2 parts wheaten bran, 2 parts crushed oats, 1 part mealie meal, 1 part pollard, ½ part crayferine.

Grain Mixture: 1 part kaffir corn, 1 part wheat screenings, 1 part crushed maize (fine), 1 part inyati.

From six to twelve weeks:—

Dry Mash (by measure): 2 parts wheaten bran, 2 parts pollard, 1 part mealie meal, 1 part crushed oats, ½ part crayferine.

Grain Mixture: 1 part kaffir corn, 1 part wheat screenings, 1 part hulled oats, 1 part crushed maize.

As previously stated the dry mashes should be fed in hoppers so constructed that no waste will occur. These mashes may also be fed in a moist state mixed with milk, soup, or the liquid in which vegetables have been cooked. If this "moist" method is adopted the mash should be fed in troughs, which must be kept scrupulously clean.

All grain should be fed in scratching litter in order to give the growing stock as much exercise and occupation as possible.

STAFF: APPOINTMENTS, CHANGES, ETC.

26/6/22 *R. J. Bulmer*, appointed Chief Fruit Inspector, stationed at the Docks, Capetown.

3/8/22 *M. M. Clayton*, M.R.C.V.S., appointed Government Veterinary Officer, stationed at Premier Mine.

7/8/22 *H. H. Storey*, B.A., appointed Mycologist, stationed at Durban.

28/8/22 *H. O. Monnig*, B.A. (hon. Stellenbosch), Ph.D. (Zurich), appointed Veterinary Research Officer, Onderstepoort.

OBITUARY.

W. M. A. Oosterlaak, appointed as Dairy Expert for the Free State on 1st May, 1911, and in 1913 as Dairy Inspector for the Transvaal: died on 26th August, 1922, at Pretoria.

O. Rivers, came to this country in 1910 in charge of a number of sheep selected on behalf of the Transvaal Government in Australia, and was attached to the Ermelo Stud Sheep Farm as Assistant. Upon the closing down of this farm in 1914, Mr. Rivers was transferred to the Experimental Farm, Potchefstroom, as Instructor and Officer in Charge of Sheep. He also supervised the experiments in crossbreeding of sheep at that station. Mr. Rivers will be remembered by many in connection with his highly interesting sheep dog demonstrations at various Rand shows some years ago. Died at Potchefstroom on the 2nd September, 1922.

NOTES FROM THE "GAZETTE."

Attention is drawn to the following matters of interest which appeared in the *Union Government Gazette*:—

(Abbreviations: "Proc."—Proclamation; "G.N."—Government Notice.)

Gazette. *No.*	*Date.*	*Item.*
1261 1262 1263 1264 1265	11/8/22 18/8/22 25/8/22 1/9/22 8/9/22	The compulsory disinfection and dipping of cattle as prescribed by the Stock Diseases Regulations, have been ordered as follows:—(1) Every five days in the five-day dip for portions of Lydenburg, Ixopo, Umzinto, Richmond, Lusikisiki, Nqutu, Nkandhla, Idutywa, Umzimkulu, Weenen; (2) every seven days in the seven-day dip for portions of Lydenburg, Middelburg (T). (G.N. Nos. 1268, 1313, 1368, 1417, 1418, 1457.)
1261 1264	11/8/22 1/9/22	The restrictions applying with regard to the movements of cattle from, into, through, and within the District of Glen Grey as imposed by G.N. No. 157 of 1922, have been raised, and such movements may now take place under permit from the Resident Magistrate at Lady Frere. (G.N. No. 1270.)
		In connection with the Co-operative Societies Act, No. 28 of 1922, which came into operation on the 14th August, 1922 (Proc. No. 118), Mr. Johannes Retief has been appointed Registrar of Co-operative Societies for the Union (G.N. No. 1273.) Further, the manner of application by societies and companies as prescribed by the Act are provided for in G.N. No. 1274. A further memorandum on such registrations appears in G.N. No. 1413.
1261	11/8/22	The restrictions imposed on the exportation of Angora rams and ewes from the Basutoland, Bechuanaland and Swazi-Protectorates imposed by Procs. Nos. 51, 58, and 57 of 1908, have been repealed (Procs. Nos. 49, 50, and 51, *Official Gazette*, No. 1096.)
1262 1264	18/8/22 1/9/22	The prohibition in respect of the introduction of cattle, sheep, goats, and pigs from the United Kingdom of Great Britain on account of foot-and-mouth disease has been withdrawn. (Proc. No. 123.)
		The Districts of Peddie, Albany, Alexandria, Bathurst, Uitenhage, parts of Port Elizabeth, and Queenstown have been declared protected areas for the purposes of the Scab Regulations (G.N. No. 1298). The movements of sheep into the protected portion of the District of Alfred, except those coming from adjoining protected areas, are restricted by regulation. (G.N. No. 1314.)
		The compulsory dipping of sheep in the Pretoria District has been ordered to be completed within the period 1st September—30th November, 1922 (G.N. No. 1331), and for the Districts of Nkandhla, Mahlabatini, and Ndwandwe within the period 1st September—31st October, 1922 (G.N. No. 1435.)
1262	18/8/22	During the absence on leave of Mr. P. J. du Toit, Secretary for Agriculture, Lieut.-Colonel G. N. Williams will act as Secretary for Agriculture as from 14/8/22. (G.N. No. 1336.)
		A new tariff is published showing the prices at which seeds and transplants of Eucalypts, Pine, Acacia, and other trees may be had on application to the Chief Conservator of Forests, Pretoria, or through the nearest Forest Officer (G.N. No. 1338.)

Gazette. *No.*	*Date.*	*Items.*
1263	25/8/22	Under the Agricultural Pests Act certain fees for the registration of fruit tree, rose plants, and other tree and plant nurseries have been fixed, and become payable on and after 19th August, 1922. (G.N. No. 1350.)
		In connection with the export of eggs from the Union, a special fee of 9d. per case has been prescribed, to be paid by the exporter, and in addition to the ordinary fee of 3d. payable under the new regulations published in G.N. No. 1202 of 26/7/22. (G.N. No. 1390.)
1265	8/9/22	The fees in respect of the export of deciduous and citrus fruit (Fruit Export Act, No. 17 of 1914) will, as from 12th July, 1922, be those prescribed by G.N. No. 260 of 6th February, 1920. The various Government Notices published subsequent to this date in conjunction with such fees (Nos. 3001 of 28/12/21 and 854 of 27/5/22) are cancelled. (G.N. No. 1448.)
		Under the Agricultural Products Grading Act, No. 16 of 1922, a special fee of 5s. per 40 cubic feet has been provided, and is payable after the 12th July, 1922, in respect of the inspection and grading of deciduous and citrus fruit for export. (G.N. No. 1452.)
		Crown Lands in various parts of the Union will be disposed of as follows:—Schoorsteenberg, Warrentina, and Cornwall, at 11 a.m., 12th October, 1922, by auction at Smithfield (G.N. No. 1451). Various farms in the Districts of Rustenburg, Waterberg, Zoutpansberg, in the Divisions of Cape and Vryburg, in the Districts of Utrecht and Lower Tugela Division, by application to the Secretary for Lands, Pretoria, before 20th October, 1922. (G.N. Nos. 1458, 1485.) The farm Melksriver, by auction, at the Magistrate's Office, Graaff-Reinet, 10 a.m., 14th December, 1922. (G.N. No. 1473.)
		Additional and amending regulations providing for cases where anthrax disease are suspected, and for reporting such to the Basutoland authorities, have been proclaimed for that territory. (Proc. No. 57, *Official Gazette*, No. 1100.)

Students Clipping Ostriches.—Grootfontein School of Agriculture, Middelburg, Cape Province.

RECENT AGRICULTURAL LITERATURE.

SELECTED LIST OF BOOKS ADDED TO THE DEPARTMENT'S LIBRARY.

[NOTE.—The first number is that of the class to which the book belongs; the last number is that of the book itself.]

GENERAL.

040.68,27 Mentzel, O. F. A Complete and Authentic Geographical and Topographical Description of the Famous and (all things considered) Remarkable African Cape of Good Hope. The Van Riebeeck Society, 1921. Capetown. No. 8171.

140 Recueil de Coefficients et d'Equivalences. Coefficients pour la conversion des poids, mesures et monnaies au système métrique décimal; tableaux d'equivalences des unités de mesure du système métrique décimal, en unités de mesures anglo-saxonnes. Institut International d'Agriculture. Rome, 1922, Imprimerie de l'Institut International d'Agriculture. No. 8187.

160 The Australasian Fruit Growers' Annual and Trade Record for 1922. Illustrated. No. 8188.

240 Macara, C. W. Getting the World to Work. Manchester, 1922. Sherratt and Hughes. No. 8184.

320 Simple Concrete Uses Illustrated. Johannesburg. W.S.A.C.C. No. 8189.

AGRICULTURE, LIVE STOCK, AND ALLIED SUBJECTS.

410 Cosnier, H. L'Ouest Africain Francais. Ses Ressources Agricoles. Son Organisation Economique. Illustrated. Paris, 1921. E. Larose. No. 8192.

410 Geldenhuys, F. E. Boekhouboek vir die Boer. Bloemfontein. De Nationale Pers. No. 8185.

430 Gehrs, J. H. Live Stock and Farm Mechanics. Illustrated. New York, 1922. The Macmillan Company. No. 8177.

430.1 Notes on the Ayrshire Breed (with Illustrations) and Appendix giving Names and Addresses of Prominent Breeders, with Particulars of their Herds. Illustrated. Ayrshire Cattle Herd Book. Society of Great Britain and Ireland, 1920. No. 8176.

445 Stapensea, J. Bydrage tot de Kennis der Nieuwvormingen in de Bynierbast van het Paard. Illustrated. Utrecht, 1922. S. den Boer. No. 8181.

460,66 Dudgeon, G. C. The Agricultural and Forest Products of British West Africa. Illustrated. London, 1922. John Murray. No. 8179.

BIOLOGY, ZOOLOGY, BOTANY, MEDICINE, ETC.

630.1 Smith, H. M. Gaseous Exchange and Physiological Requirements for Level and Grade Walking. Illustrated. Washington, 1922. The Carnegie Institution of Washington. No. 8180.

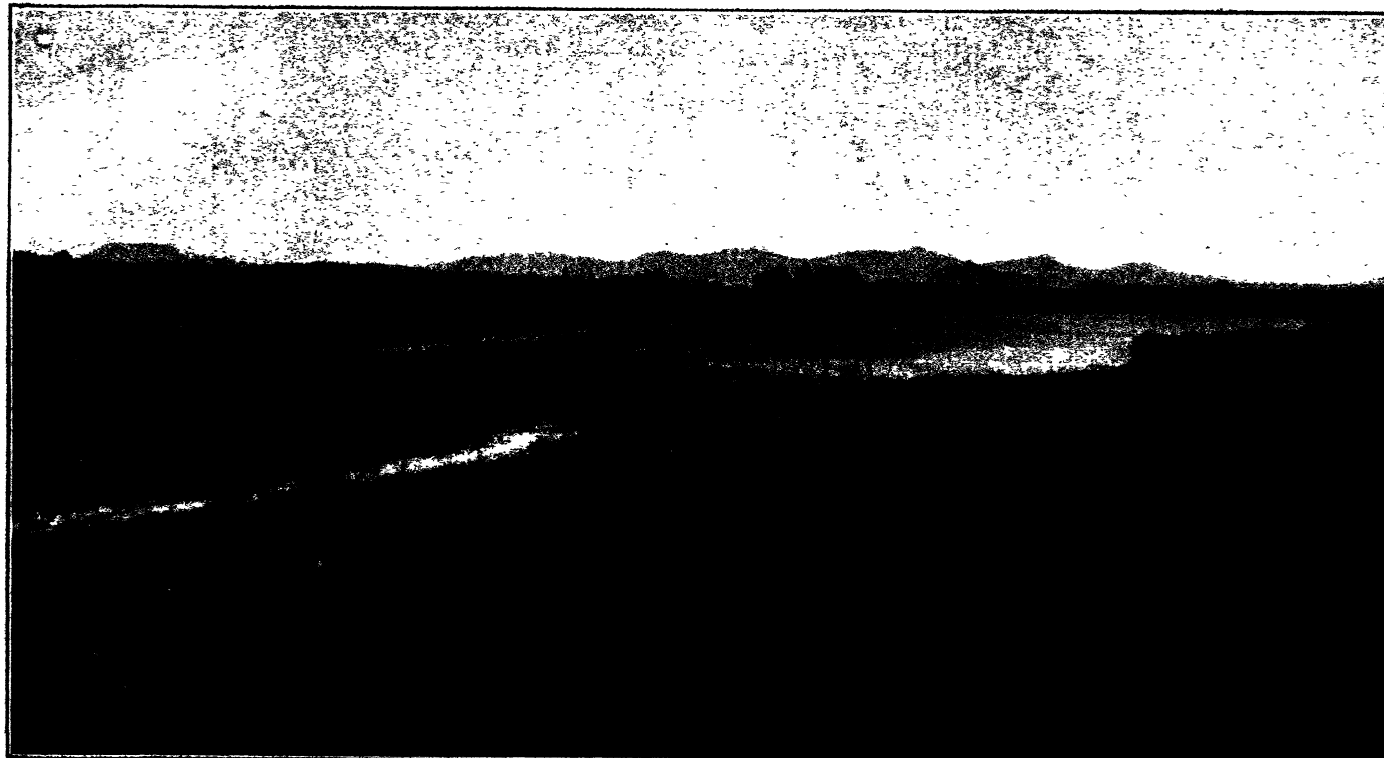
630.601 Gunst, J. A. Over Antagonisme van den Bacillus Pyocyaneus. Amsterdam. A. H. Kruyt. No. 8183.

630.6961 Raabe, J. F. C. Over de Waarde van Sulfoliquid als Antiparasiticum en Antipruriginosum by Kleine Huisdieren (Hond en Kat). Utrecht, 1922. F. W. Hager. No. 8178.

630.6961 Van der Hoeden, J. De Complementbindingsreactie by Echinococcose van Mensch en Dier. Berlin, 1922. Emil Ebering. No. 8182.

635.2 Enquete sur la lutte contre la mouche des Olives (*Dacus oleae*) dans les divers Pays. Rome, 1922. Institut International d'Agriculture. Imprimerie de la Chambre des Députés. No. 8190.

638,49,2 Van Oort, E. D. De Vogels van Nederland. Aflevering 10/12, 30 plates; aflevering 13/14, 20 plates. 's Gravenhage Martinus Nyhoff, Nos. 8170 and 8186.



A KARROO SCENE.
The Conservation of Water.

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NOTES.

The Retirement of Mr. E. J. Macmillan, Under-Secretary for Agriculture (Education).

On the 30th September last Mr. E. J. Macmillan, B.S.A., who since November, 1919, has been in charge of the Agricultural Education Section of this Department, retired on pension.

Mr. Macmillan came to South Africa in 1904, having obtained the appointment of Chief, Experimental Farms and Live Stock Division, to the Orange River Colony Department of Agriculture at Bloemfontein, and was associated with that Administration during the period when notable advances in agricultural development in that Province took place. Following on the Anglo-Boer war, the prospects of farmers and settlers were at that time far from bright, but difficulties were gradually surmounted largely as the result of the progressive policy initiated from Bloemfontein. That was the era which saw the introduction of large numbers of sheep from Australia, the importation of pure-bred horses and cattle from Europe, and the establishment of experimental stations and stud farms. The latter have since been discontinued, but the results are evident in improved flocks and herds, and the advances that agriculture generally has made in the Orange Free State.

The reorganization of the Civil Service at Union found Mr. Macmillan retained at Bloemfontein; subsequently he was appointed to the Principalship of the Potchefstroom School of Agriculture and Experiment Station, when that post fell vacant in 1913 owing to the transfer of Mr. Alex. Holm to Pretoria in the capacity of Under-Secretary for Agriculture (Education). When Mr. Holm accepted the Directorship of Agriculture at Nairobi in November, 1919, Mr. Macmillan succeeded him.

Mr. Macmillan is a Canadian by birth, and received his general education and agricultural training in that Dominion. He is returning to his home in Prince Edward Island, but it is not known whether he will settle permanently in Canada or come back again.

Mr. Macmillan was an exemplary servant of the Government, and his many qualities gained for him the esteem and respect of his colleagues and the large number of farmers with whom his duties brought him in contact.

Extending the Oversea Market.

Of outstanding importance to farmers is the establishment of a market for their produce, whether it be local or otherwise, and whatever effort is expended in fostering such trade is of value to the community. There is now in South Africa a well-known merchant of Bristol, England, Mr. John A. Rowlands, recent President of the Bristol Channel and West of England Corn Trade Association, who has been in touch with the Department on the subject of opening up direct trade relations between the Union and that large portion of England and Wales served by the port of Avonmouth, which would also be a regular port of call for steamers trading between South Africa and England. Mr. Rowlands is confident that an extended and lucrative trade could be established in that direction, and he has already contributed to the Bristol Press favourable reports on the great possibilities of South Africa. He has sent a series of articles to the leading paper of the West of England, and proposes to continue this propaganda while trade prospects remain hopeful. He is also keeping in touch with the Bristol Chamber of Commerce and other representative commercial bodies in that part of England. Mr. Rowlands has recently taken up certain business interests in Natal, and while the immediate object is to develop trade locally, he aims at extending operations oversea to that portion of England with which he is intimately acquainted and where his influence counts. Mr. Rowlands' efforts in making known South African products on a market that he points out has hitherto received little direct attention, are appreciated, and it is trused will lead to the establishment of trade relationships. To those interested, we would mention that Mr. Rowlands' address is P.O. Box 77, Pietermaritzburg.

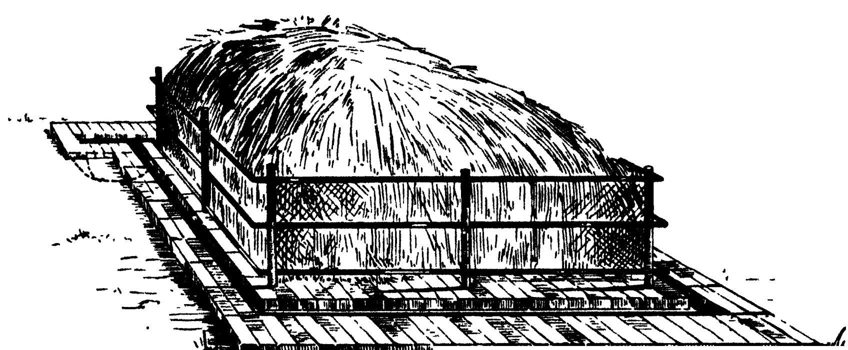
Fattening Poultry for Table Purposes.

How at an extra cost of only one penny per bird, cockerels of the light breeds, generally regarded as of little use for table purposes, may have one-third added to their weight with the flesh rendered more tender and improved greatly in flavour, is related in an article published elsewhere in this issue. It is written by Mr. Nash, the assistant in poultry at the Grootfontein School of Agriculture, where experiments were carried out with the above result. With the little extra labour and cost involved in cooping and feeding the bird, the hitherto lightly considered cockerel may be turned into a source of revenue and profit. It is worth the consideration of both farmer and townsman, for the treatment suggested by Mr. Nash has shown that what would otherwise have probably been a somewhat untasty morsel may be turned into a succulent table bird, amply repaying the care necessary to render it such.

The Disposal of Manure: A New Device.

There is published in the *South African Medical Record* of the 24th June, 1922, a memorandum by Dr. Haydon, the Assistant Medical Officer of Health for the Union, on the disposal of animal manure and garbage in relation to fly-breeding, and the prevention of enteric fever and other intestinal diseases. It refers to a new device, known as "Baber's," for storing manure and garbage in enclosures, the object being to attract all mother flies in the neighbourhood to lay their eggs in the manure and thereafter to destroy the maggots that have been hatched: at the same time the process of stacking rots down the manure quickly, making it suitable for fertilizer. Farmers are well aware of the high proportion of fly-borne diseases, and for the reason alone that by its means flies are reduced to a minimum, the device deserves their consideration. But in addition to this outstanding service, it serves the purpose of collecting and putting to the best use all farm manure and refuse of a fertilizing value.

The device consists of enclosures of wire mesh on cement or brick platforms. (See accompanying illustration). A channel sunk in the



Perspective showing Handling of Manure on small scale.

platform surrounds the enclosure; the manure and garbage are dumped in the enclosure and firmly trodden down, and the heat engendered by the fresh material (very attractive to flies) drives all maggots through the meshes of the containing fence so that they eventually fall into the sunken channel when they are collected and destroyed. This method has been tried by the Kimberley Municipality with very satisfactory results; also at Armoed's Vlakte, Vryburg, it has been found to render practically fly-free what was formerly a badly fly-infested place.

It is necessary to have more than one of these enclosures to get the best results. The fresh manure is forked direct into the enclosure, being well pressed down, especially round the sides. Close packing of the manure at the edges is the secret of success: this consolidates the heap, enables decomposition to set in more rapidly, and provides the required heat in the stack. In the centre of the stack holes may be made from time to time for burying in the contents of latrine buckets, offal, and any house refuse that will easily rot. The heat in the stack

should be sufficient to destroy disease-producing germs. These materials rotted down increase the fertilizing value of the stack. The female fly is attracted by the fresh manure, and there the eggs are laid: soon afterwards the maggots show signs of activity. Escaping from the heat of the rapidly-decomposing heap, the maggots find their way to the edge of the stack from where they drop through the meshes to the cement floor outside. This floor, however, is also too hot, having been heated by the sun, and the maggots migrate further to the channel where they are collected. They may then be fed to the fowls.

In the course of time the manure in the first enclosure cools off, and the variation in temperature is not suitable for maggot breeding. The stack no longer attracts the female fly, and it is then that the succeeding second, third, or fourth enclosure (as required) with its fresh manure must be at hand to continue the process.

Treated in this manner it is estimated that manure is three or four times the value of that rotted down in the ordinary manner: in a dry climate, however, liberal watering of the stack every day is necessary to promote decomposition and heat development. The cost of construction of the platforms can be cut down by paving with ordinary cobble stones grouted in cement, using solid cement work only at the edges of the enclosure and for the channel. It should be possible for cement works to turn out at low cost blocks for the laying of the channel, sump, and edges of the enclosure. If desired holes could be provided in the blocks for the insertion of the fencing standards, so that the remaining construction work would only consist of laying the blocks to plan, roughly paving the space enclosed, and putting up the pig wire fence.

Where it has been adopted, the device has given remarkable results: it is described by Dr. Haydon as being more successful than any methods hitherto in vogue for disposing of manure and garbage for a useful purpose, and at the same time effecting that greatly desired object, the clearance of the house-fly and the many ills it engenders.

It is requested that any person using this device will communicate the results to the Editor.

The Castration of Animals with the Burdizzo Pincers.

The publication in the August, 1921, issue of the *Journal* of an article by Dr. Veglia, Division of Veterinary Education and Research, regarding the invention of Dr. Burdizzo for castrating animals, caused widespread interest, and many inquiries followed regarding the process. Since then observations on the manipulation and effectiveness of the pincers have continued at Onderstepoort, and further hints on the subject by Dr. Veglia are published in the present issue of the *Journal*. The expeditious and humane castration of animals is an important matter to pastoral South Africa, and the Burdizzo method, which is gaining wide popularity, has advantages which Dr. Veglia considers justify its adoption in this country. For further particulars, application should be made to the Director of Veterinary Education and Research, P.O. Box 593, Pretoria.

The Control of the Union's Export Trade.

The expanding agricultural industry of South Africa brings more and more insistently to the fore the question of oversea markets for the absorption of our surplus agricultural products. It is a matter of great concern to every farmer, and it is necessary that each should be acquainted with the manner in which the export trade in produce of the land is controlled by legislation. Frequent references have been made in the *Journal* to the need of studying (especially at this time when some of our products are making their first essays at securing a footing on the world's markets) the requirements and, indeed, the idiosyncrasies of the consumer oversea for whom we wish to cater. And it is of surpassing value to the producer that legalized machinery exists which controls to a large extent the quality and appearance of products that leave our shores. The scope of this machinery is briefly outlined in an article published elsewhere in this issue of the *Journal*. Although wool, mohair, and ostrich feathers are not affected, it will be seen that the Acts (and their relative regulations) concerned cover very comprehensively the products of the land. One of the Acts, recently passed, contains the principle of the levy on exported produce, already in operation in so far as fruit and eggs are concerned, while at present cotton growers also are on the eve of having their product graded and the levy applied.

The above is a continuation of the series of principal Acts and regulations administered by the Department, a résumé of each of which it is proposed to publish in the *Journal*. In the two previous issues the Diseases of Stock Act and the Agricultural Pests Act, with their principal regulations, were outlined.

Lucerne Meal: Oversea Trade Possibilities.

Reference was made in last month's issue of the *Journal* to the possibilities of an export trade in lucerne hay, and the desirability of a test consignment. The export of South African lucerne in the form of a meal has also been receiving attention, and it is stated that the prospects for trade in such an article are favourable, the English market being a wide one, while in Denmark also the demand is considerable. There is a firm in London who state that they are the originators and practically the only suppliers in the United Kingdom of lucerne meal, and that their brand is the only one that is really known. This firm is willing to act as agents for any South African producers who can ship a good class of meal, ground to the requisite grade, and of a bright green colour. The prices to be fixed are given as follows, per ton of 2240 lb., f.o.r. London:—5-ton lots, £12; 2-ton lots, £12. 10s.; 1-ton lots, £13; the commission to be 20 % off these prices. All bags are to be supplied free, and the meal must be packed so as to weigh 112 lb. net.

The firm in question suggests that any one desirous of opening trade in lucerne meal should send to them a small trial consignment at the earliest opportunity so as to introduce the commodity on the English market. Further particulars will be furnished on application to the Secretary for Agriculture, Pretoria.

Home Canning of Vegetables and Fruits.

It is obvious that whatever is done to foster the agricultural industry of the country, little will result without the vigorous application of the farmer in practising those measures devised to further his industry. Naturally conducive to health, the best work of the farmer, nevertheless, depends upon home conditions, particularly in respect of his daily diet, and it is to the housewife, therefore, that the worker looks for those essentials that promote energetic and thorough labour. Every good housewife knows the importance of providing in the daily diet some form of green vegetable or fruit, and the canning of fruits is a home industry in which most are interested and that many excel in. Miss Ferguson, the Lecturer in Domestic Science at the Elsenburg School of Agriculture, contributes an article to this issue of the *Journal*, the outcome of scientific experience, and in which is explained the process to be followed in canning fresh fruits and vegetables so as to preserve them as nearly as possible in their fresh, juicy state. The various methods are referred to as well as the needed implements, and it will be seen that the requirements for this very necessary class of home industry are within the reach of all. While fruit canning is widely practised little has been done until recently in the way of canning vegetables, which in many respects is a simpler process, yet the value of the green vegetable is so great that where it cannot be obtained in its fresh state throughout the year, efforts should be made to provide the canned article. The advice given by Miss Ferguson and the illustrations amplifying it, should prove very useful to housewives in those parts of the country particularly where the lean seasons are protracted and the need exists for preserving fruits and vegetables for use when the short seasons of plenty are past.

Agricultural Experiment: Variations and Interpretations.

The Department has recently issued a new Science Bulletin, No. 22, "Agricultural Experiment, its Design and Interpretation,"* by Mr. Parish, Vice-Principal of the Glen School of Agriculture and Experiment Station. As its title denotes, it deals with a subject of great importance to officers of the Department and, indeed, investigators throughout the world who are engaged on experimental work. It is a matter, also, that affects the farmer very closely, for the proper interpretation of the greatly varying results obtained from field trials and live-stock experiments requires the careful attention of officers specially trained for that class of investigation. The farmer is, naturally, not concerned with the design of the experiment, and many are not aware of the sedulous attention to detail and the scientific deduction that it entails. Mr. Parish has, therefore, contributed a short article to this issue of the *Journal*, which shows what properly conducted experiments involve. It is well worth the attention of the farmer, and particularly the increasing number that are joining the Department in carrying out co-operative experiments, for a hasty interpretation may often be misleading and dangerous.

* Obtainable on application to this Office. Price 3d., prepaid.

Advantages of the Silage System.

Under the above title, Mr. Parish, Vice-Principal of the Glen School of Agriculture, contributes an article (published elsewhere in this number of the *Journal*) the truth of which must be evident to all. When one considers the possibilities of the country, and looks ahead to the time when it will rank high in the world's production of milk and meat, the increase in our herds (about 4½ per cent. annually) appears unduly tardy. Yet there lies at our hands the means of speeding our increase and improving the quality of our meat, and a perusal of Mr. Parish's article must impress the undoubted advantages that will accrue from a wider use of the silage system. Although the silo has been known in South Africa for the past twenty years, its use has not spread as rapidly as its undoubted advantages warrant; census returns show that at the 30th April, 1921, there were 1329 pit silos and 549 erected silos in the Union, the quantity of ensilage produced during the twelve months ended on the above date being 89,147 tons. The development of our cattle industry depends greatly on a sound system of feeding, and the basis of this, Mr. Parish points out, will be silage. Where this very important part of farm practice is neglected, the stock owner must expect at his side the spectre of drought. With a full silo he can view with equanimity the approach of the dry season, conscious that he has the wherewithal to keep his stock alive. It is surely a matter of first consideration.

Tsetse Fly Investigation.

During September the Station on the White Umfolosi was visited by Mr. Claude Fuller, Acting Chief, Division of Entomology, in company with Professor J. C. Faure, of the Transvaal University College. Some time was spent examining the progress of the work made and the general environment of the station, which is located in the heart of a great bush savannah and the big game country. Subsequently with Mr. Harris, officer in charge of the station, Northern Zululand was visited to see into the extent of the rest of the fly country, and the reported presence thereabouts of *Glossina brevipalpis*, a species of Tsetse. At Nduma the entomologists came in brief contact with the Prime Minister's party and during a short stay there the margins of the large pan or bayou, known as Lake Inyameti, revealed several breeding grounds of the fly. The presence of cattle feeding along the lakeside, coupled with a local consensus of opinion that Nagana is absent, is recorded as a matter of interest. To this it may be added that it is extremely probable that *G. brevipalpis* is associated with most of the large bayous so characteristic of the Pongola River in Tongaland. The previous records of this species in the Union relate to specimens obtained by Mr. R. A. L. Brandon, now magistrate at Ingwavuma, when stationed at Ubombo, and the capture of one specimen by the Hon. Denys Reitz, Minister of Lands, on Lake Inyameti in 1921. Mr. Brandon's specimens are in the Durban Museum, but the exact locality from which they came is not indicated.

It is of interest to add that, up to the present, no further evidence regarding the existence of *Glossina austeni* in Zululand is available beyond the one insect captured by Mr. Brandon on the heights of the Ubombo; this specimen is now preserved in the British Museum.

Departmental Development: A Division of Extension.

Few, if any, countries in the world can, comparatively speaking, show better progress than ours has in farming during recent years, due to the unremitting efforts of the farmer and the work of the Department of Agriculture in South Africa. There are many farmers alive to the advantages to be derived through close touch with the Department, and their eagerness to receive the advice and assistance it is able to render is, it is shown, rewarded by the benefits that follow advanced methods of farming. There are others, however, who do not enjoy these benefits to the full and that might be theirs by putting into practice the methods, the outcome of both local experience and world-wide research, the Department constantly advises. It is to be expected that in a country of great distances and sparse population, difficulties abound in keeping in close touch with the farming community, though the Department has endeavoured to cope with the situation as far as its organization and limited staff have made it possible. In a large measure it depends on its *Journal* to bring to the home of the farmer a monthly bulletin of original agricultural literature of essentially South African applicability, that will keep him cognisant of the work and thoughts of the Department.

A stage in our development has arrived where our produce must enter into competition on the world's markets with the best that farmers in other countries (with the close assistance of their respective Departments of Agriculture) are able to produce. Under conditions that now exist in the Union, the present is a critical stage, and there are those farmers, referred to above, who are alive to the situation and are joining with the Department in coping with it. But with the majority a general speeding up of effort is imperative if the advance that has characterized the agricultural industry in recent years is to be maintained, and with a view to this attainment the Department has decided to focus a section of its activities in a Division of Extension. Under the direction of Mr. Heinrich S. du Toit, who, as Government Agronomist, and recently as Chairman of the Drought Investigation Commission, is known and respected by farmers in all parts of the country, the Division will aim at co-ordinating the work of Departmental officers whose duties bring them in touch with the farmer, and at building up that organization among the farmers themselves which history has shown to be the only foundation on which a sound and lucrative agricultural industry can be established.

In the first case, it will be the duty of the Division to organize the various officers of the Department throughout the Union so as to make the best use of their services in meeting farmers, and their wives and children, at more or less central places in the several districts. Overlapping and dissipation of effort will be guarded against, and in consultation with the governing bodies of different farmers' organizations a programme of work, if possible for twelve months hence, will be drawn up from time to time, so as best to meet the interests of the district at the most suitable seasons. Thus groups of officers will be detailed to operate in various areas at prearranged periods of the year.

By far the most important part of the Division's duties will be to use every possible means of accelerating organization among

farmers themselves, for to a great extent the efficacy of the Department's activities is limited by the progress made in this direction. Farmers must organize on a sound, uniform basis, so that they may arrange to meet the officers of the Department to the best advantage, and, above all, acquire a self-reliance that will enable them unitedly to overcome the many economic problems that concern their industry, without resource to the State for financial aid. There is so much to be done, and so many ways of doing it, in furthering the welfare of the farmer, that a capitulation here is impossible. The Division will point the way and endeavour to take a lead, as far as possible, where movements may be started that will raise the moral and material welfare of the farmer. It will disseminate advice regarding the best methods of farming and marketing, and the several means of elevating rural life through the medium of clubs for men, women and children, and of other amenities. It will advocate and induce co-operate effort in dealing with both major and minor products, from organizations that combat human and animal ills, and contend with problems of soil erosion, veld control and such like, down to those concerned in the humbler and domestic duties of the housewife, yet which are so potent an agency in promoting good husbandry.

There can be no doubt that a Division centred on the above sphere of work should do much in engendering, by helpful advice and initiative, that co-operation and spirit of progress which is needed among our farmers to place them in the forefront of the world's producers. It is a departmental activity launched in the confidence that the rural community will respond and meet the Department's endeavours more than half way. It is a movement, moreover, that should have the full support of the general community in the possibilities it holds for raising the standard of our chief industry of agriculture. Starting with a small nucleus of workers whose activities must necessarily be circumscribed by their numbers, the new Division of Extension is expected to sow the seed of mutual trust and understanding between the Department and the farmer that will continuously return a crop of benefits to the Union.

Intensive Poultry Keeping for Town Dwellers.

Excellent results have been obtained at the Glen School of Agriculture from an experiment carried out over a period of twelve months with six South African Utility White Leghorn pullets. The object was to test the possibilities of keeping the home supplied with fresh eggs, even in the limited space available usually in the town dwelling. In an article published elsewhere in this issue, Mr. Jordaan, who conducted the experiment, details the construction of the houses used, and the feeding and treatment of the fowls; he shows also the expenditure involved and the returns. These six pullets, between six and seven months old, and chosen at random from among fifty odd bred at Glen, laid 1,470 eggs during the year at an average cost of 7d. per dozen. "The conclusion drawn from the test," Mr. Jordaan states, "is that the housewife may, without much expense or labour, keep her own egg-producing hens in her backyard, no matter how small, and have a supply of fresh eggs for the greater part of the year."

The Sheep Blow-Fly Danger.

It is fortunate for sheep farmers in this country that they are spared the enormous losses suffered from the sheep blow-fly by pastoralists in Australia, where the pest is one of the principal stock problems contended with, entailing much investigation and the establishment of a special experiment station. It is a matter for grave concern, however, to know that the pest is found in South Africa, for its presence is a potential danger: in certain areas, indeed, farmers are already engaged in systematic control measures. Reference has been made in previous issues of the *Journal* to the investigations that are proceeding into the occurrence of the pest in the Union, and there is published in this number another article by Mr. Munro, the Border Entomologist of the Division of Entomology, setting out the results to date of his investigations, the foundation knowledge that will prove of great value to our farmers. There are at least three species of fly in South Africa that are concerned in blowing sheep's wool, and which are described by Mr. Munro. It is possible there may be others. Much has still to be done before it can be said that everything is known about the blow-fly in South Africa, information that is necessary to ensure a successful combat with the pest should it increase, and for their own protection, therefore, farmers are asked to combine with the Department in its endeavours to investigate thoroughly the occurrence of the pest within its borders. The lines on which this assistance can be rendered are stated by Mr. Munro at the end of his article, and it is trusted that a ready response will result, so that this useful work may be pressed on with all possible speed.

The Control of Anthrax: An Important Conference.

The departure of Mr. R. W. Dixon, the Assistant Principal Veterinary Officer, to attend the International Veterinary Conference in London, has a significance that should hold the attention of every South African stock owner. The conference, which takes place on the 5th December next, has been called together for the purpose of discussing ways and means of combating anthrax, with a view to eradicating the disease among animals and to the protection of industrial workers against infection. No effort is spared by the Department in controlling the disease in the Union, and every farmer must now be aware of the correct methods of dealing with outbreaks and the disposal of animals that have died from anthrax. Wide publicity has also been given to the serious check to South African trade overseas in wool, mohair, skins, and hides, that may follow if the spread of the disease in this country induces those responsible for the well-being of industrial workers to introduce methods, in the form of disinfection of these products, to protect oversea handlers of our wool, etc., from contracting the disease. Such restrictions would handicap our trade and result in monetary loss to the producer. The conference is to be held under the auspices of the International Labour Conference, and is the outcome of resolutions passed by the Anthrax Commission appointed by them to consider the disinfection of wool infected with anthrax spores. The guarding of workers against this dangerous disease, which is carried by the wool, etc., of animals that have died from anthrax, is rightly viewed very

seriously, and there is no doubt that the conference will rigorously advocate efficient means of protection. An embargo has already fallen on the products concerned of certain countries where anthrax is known to be rife, but fortunately the cleaner state of the Union has hitherto prevented a similar disability being placed on our exported wool and other produce liable to anthrax infection. The Department views the presence of anthrax in the Union as the greatest menace of all the diseases to which our live stock is subject, and the efforts being made to control its spread, combined with that most important of all things, the rapidly awakening realization of the farmer to the danger and his greater co-operation with the Department, will, it is trusted, convince those who will meet in conference that the situation in South Africa does not call for any embargo on our exports. Mr. Dixon is intimately acquainted with the position of anthrax in this country and of the various steps in operation to prevent its further spread and to bring about its eventual eradication, and farmers may be assured that the interests of the Union will be fully and conscientiously guarded by him.

Pig Breeding in South Africa.

During his visit to the Union some months ago, Sir Henry Hall, President of the English Large Black Pig Society, inquired into the treatment, progress, and prospects of our pig industry. He was principally interested in Large Blacks, but is of opinion that his conclusions apply with equal force to pig breeding generally in the Union. One of them is that Large Black pigs deteriorate rapidly here. The second generation show evidence of losing their points and of becoming smaller, the causes being ascribed by Sir Henry to the following defects in treatment: (1) Litters are weaned too early; the young pigs are thereby deprived of their natural food and prematurely given food which they are unable to assimilate properly. (2) Mating too young, resulting in unhealthy and stunted progeny. (3) The feeding is unscientific and haphazard.

A properly grown pig should weigh 180 lb. at six months, whereas pigs were seen exhibited at Bloemfontein and Johannesburg shows, which at this age would not turn the scale at 120 lb. During his four months in South Africa he dealt with many inquiries, which pointed to very little knowledge of pig raising, and he considered that, while the country was suitable for the production of pigs, the industry was going back through ignorance of proper methods of treatment. He is of opinion that with our present stock, our meat-producing capacity could be doubled in twelve months, and he has been assured that the existing capacity of the bacon-curing factories could deal with twice the present production; also that English markets would take our bacon provided a suitable animal was produced.

On his recommendation, the Large Black Pig Society has agreed to undertake propaganda work in South Africa on behalf of their breed, having impressed upon the society that no satisfactory results can be obtained until our breeders deal with their animals on common-sense lines: if farmers adopted proper methods the industry would figure prominently in the future prosperity of South Africa, but until this change is brought about, he does not advise the sending

of pedigree stock to South Africa, as it might result in loss to the importer and perhaps bring discredit to the herd of the seller.

Much of what Sir Henry Hall says is applicable to existing conditions in the Union, though there are notable exceptions. It must be remembered, however, as a general rule, that the pig is still looked upon merely as a side-line of little account, and consequently left largely to fend for itself, receiving such treatment as the farmer may be able to spare after the main activities of the farm have been attended to. Yet were the importance of the industry and the advantages of proper treatment fully realized, there would follow a great advance in the development of pig breeding in South Africa. But even amongst breeders there is doubtless much more knowledge to be acquired regarding breeds and their characteristics, proper selection and culling, and housing and feeding generally. The Department has been considerably handicapped through shortage of staff and lack of funds in developing and encouraging the industry, but its officers have always given advice and assistance whenever able. Last year also, Mr. D. C. Laver, the President of the Pig Breeders' Association of South Africa, was granted free railway facilities to visit certain centres in the Union, and carry out extension work; the long absences which such work necessitates from his own business have, unfortunately, prevented him from continuing these activities.

Sir Henry Hall, as a result of his visit, has certainly directed greater attention to the suitability of South Africa as a pig-raising country, and though his criticisms have been severe it is hoped that they will be received in the spirit in which they were offered. He is sending out a Large Black gelt to Elsenburg, and hopes to inspect her progeny on the occasion of his next visit to South Africa sometime in the beginning of next year. In a recent letter to Elsenburg, furnishing particulars of the gelt, Sir Henry concludes by remarking that in England bacon pigs are fetching 24s. per 20 lb., which leaves a good margin, and that if South African farmers would breed for the English market, and the curers supply the bacon required, there exists a lucrative trade for all concerned.

Single Testing Pens for Poultry at Glen School of Agriculture.

DEPARTMENTAL ACTIVITIES.

(NOTE.—The work of the several Divisions and Schools of Agriculture covers a wide range of agricultural industry in the Union, and we give hereunder notes and observations from certain of them treating with matters of special interest coming under their purview month by month. The object of these notes, which are not concerned with general routine work, is to inform the farmer of such matters as are calculated to be of interest and helpful to him at the present time.—EDITOR.)

THE DIVISIONS.

ENTOMOLOGY.

Advice Misapplied.—There are certain insect pests, noticeably woolly aphis of the apple and the fig-tree mealy bug, which winter in small colonies, and in summer breed up and spread over the trees. The Division often recommends the destruction of the small over-wintering colonies by dabbing them with certain insecticides. A paint brush is usually suggested as the implement and, for woolly aphis, raw linseed oil as the medium for dealing death to the creatures.

Unfortunately, by recommending a paint-brush "painting" is suggested and because this is so it may happen that a tree is painted with oil instead of the oil being dabbed or rubbed into the insects. Within the last month two correspondents have complained of the death of trees through painting with oil, and one is not certain whether raw or boiled oil was used. It naturally follows that when a tree is painted over with oil the lenticels are choked, the bark seriously injured, and the life of the tree jeopardized. Raw oil may be used for the fig tree mealy bug; methylated spirit may also be employed with satisfactory results.

Cockchafer Beetles.—These periodical pests have again made their appearance, the first record of serious injury for this season occuring in an apple orchard near Magaliesburg, Transvaal. Any one of several species may be concerned in attacks of this nature. Some are small, roundish, deep-red beetles; others are about half an inch long and brownish or grayish in colour. All have the habit of clustering at night on the tender twigs of fruit trees, roses, grape-vines, etc., and hiding during the day in the ground near their food-plants. The immature stages are passed as grubs in the soil, and it is reasonably supposed that they feed on the roots and grasses and other plants. When present in numbers, the beetles can do considerable damage, often completely defoliating the trees, and destroying the blossoms and setting fruit. Their control means persistent and thorough work while they are on the trees. One method is to jar or brush them into tins containing an inch or two of water on top of which has been floated a layer of paraffin. Such work should be done in the evening, by lantern light, when the beetles are feeding. Another method is to keep the trees well covered with arsenate of lead, using the poison at the rate of 4 ounces of the paste, or 2 ounces of the powder to 4 gallons of water. During the daytime the beetles may be collected from their hiding places in the soil, but this method is both slow and laborious.

Cluster Bugs.—A few complaints have been received lately about these evil smelling, grayish-coloured insects (*Agonoscelis*, spp.). They usually attract attention because of their habit of clustering in numbers of trees, where they seek shelter during the winter. When warm weather comes they disperse to nearby veld plants to breed. These insects are rarely troublesome, and it is mainly the numbers in which they gather together that causes alarm. The time to destroy them is while they are clustered on the trees. Brushing them into a paraffin tin containing a little water and paraffin oil is the easiest way to deal with them.

Cotton Insects.—An interesting letter was received recently from a correspondent living in the eastern Transvaal, relating his experiences in controlling cotton insects. It was found that leaf-hopper or jassid injury could be reduced to a minimum by practising autumn or winter ploughing followed by a bare fallow until the crop was planted the following spring. Unploughed fields, overgrown with weeds and old cotton plants, were observed to harbour the insect over winter. Early planting on autumn or winter ploughed lands was found to be beneficial in that it ensured a vigorous growth before leaf-hopper attack eventuated. For cotton stainer control, a barrier was ploughed around some fields, and a strip burned off around others. The result was that these fields were practically free of stainers, whereas neighbouring untreated fields were badly infested, the conclusion being that infestation comes from the outside and works inwards.

These observations coincide with those of the Division, and it is strongly recommended that the practices outlined be followed. Cotton insect control must be accomplished by cultural methods, and this piece of practical experience shows that it can be done.

Wheat Louse or Aphis.—This pest of wheat and allied cereals has been causing considerable trouble during September in Griqualand East and the northern and eastern parts of the Cape Province. It is not a serious pest every year. Weather conditions that particularly favour the insect, absence of parasites and enemies that normally keep it in check, and adverse conditions for the growth of the wheat crop, lead to outbreaks. An important point is to keep the wheat in as healthy a condition as possible, especially during the winter. As warm weather comes on the enemies of the louse and conditions unfavourable to it usually increase, and control the pest effectively. If the aphid attack is very severe in patches, it is advisable to burn these over, and if the whole field appears to be threatened it should be fed off. Direct control measures such as spraying, are impracticable.

Refuse Tobacco as Insecticide.—Several inquiries have been received recently as to how refuse tobacco can be used for insect control. Tobacco, such as unmarketable leaves, stems, etc., can be made into a decoction that is useful for the control of sucking insects, like plant lice. However, the strength of this liquor varies considerably according to the tobacco used and the thoroughness of extraction. The usual formula is to chop up five pounds of tobacco and allow it to soak in water for several days or to simmer over a fire for about two hours. Such a decoction is diluted with water to make ten gallons.

BOTANY.

Internal Brown Fleck in Potatoes is a very serious trouble with which potato growers on the high veld have to contend. Affected tubers are externally sound, but occasionally, when there are brown flecks near the surface of the tuber, these show through to the surface. Such cases are comparatively rare, and by this characteristic tubers affected with internal brown fleck can be readily distinguished from those attacked by Irish potato blight or late blight which also causes a brown discoloration of the tuber: in the latter cases the discoloration is always near the surface and causes depressed areas on the skin of the tuber which can readily be detected without cutting it.

Tubers affected by internal brown fleck keep well, which is another point of difference from those attacked by fungous diseases, and are as a rule quite free from external discoloration. When affected tubers are cut across, however, they show brown flecks in the otherwise sound flesh. These vary in size from a pin's head to about one-third of an inch in diameter; they may be very numerous, or only two or three may be discernible in a section through a tuber. In any case the edible qualities of the potato are impaired, as the brown specks remain quite hard when the tuber is boiled and can be picked out from the soft part of the flesh. The spots are scattered and correspond with those of potatoes affected with "internal disease" rather than with "streak."

If an affected tuber be cut across and allowed to dry, the healthy part of the flesh shrinks, but not the corky flecks, and these become raised above the cut surface as they do not take part in the general shrinkage due to loss of water. The same thing happens if pieces of the tuber are dehydrated in alcohol.

From the knowledge at present available it would appear that this is a deficiency disease occurring for the most part in rather sandy soils which are deficient in lime and available phosphates. It is our intention to make further investigations into the cause and prevention of fleck, and any farmers who are willing to co-operate are invited to communicate with this Division.

Quack Grass, a Troublesome Weed.—We have recently had *Agropyrum repens* (quack grass), also known as twitch grass and conch grass, sent in for identification from Volksrust, where it is reported as being a most troublesome weed in cultivated lands.

Quack grass very much resembles rye grass in general appearance. It has the same kind of inflorescence, grows to a height of two or three feet and has narrow, rather long leaves. The long creeping underground runners of the former, however, are entirely lacking in the latter grass, and it is these that make quack grass such a troublesome weed and so difficult to eradicate. In America, where it is well known, it is said to make most excellent hay being both nutritious and palatable, but at the same time, like our kikuyu, it is a pest to cultivated lands where it is not wanted. The best way to eradicate it is to plough early in spring, and then use a shovel-toothed cultivator every three days through the growing season, cutting off all green shoots below the surface of the ground. A crop such as mealies that can be easily cultivated should be planted, and all green shoots of the quack grass persistently kept down. The reason for this is that the long roots are fed by the green shoots, and if their source of nourishment is cut off the roots must die.

Grasses and Clovers at Groenkloof and the Dry-lands Station.—The grasses that came through the winter best were *Phalaris bulbosa* and Rescue Grass (*Bromus willdenovii*). Three cuttings were obtained from *Phalaris bulbosa* between May and August, giving five cuttings in twelve months from the date of planting. Rescue Grass remained green throughout the winter, but the stand was too thin to enable one to get a cutting.

Amongst the indigenous grasses *Pennisetum unisetum* (Natal grass) again proved itself to be very frost resistant. It seemed to stand the cold much better on dry lands than under irrigation. This may be due to the irrigated plots being on a much lower site than those situated on the dry lands.

Since the rains all the grasses both indigenous and exotic have commenced putting on rapid growth with the exception of Molasses grass which has been completely killed by frost.

About 30 varieties and strains of clover are being tried at Groenkloof under irrigation; the two outstanding varieties are Medium Red and Berseem Clover, the former standing about 3 ft. to 3 ft. 6 in. high and the latter 1 ft. 6 in. to 2 ft. The Cape Burr Clover has also put on vigorous growth since July, but being of a prostrate habit of growth is not so conspicuous as the other varieties.

National Herbarium.—A correspondent from Wolmaransstad sent in a specimen of *Typha* (Bullrush) and reported it was choking his dam. It is the first occasion this plant has been reported to the Division as a potential weed. The plant is common in most vleis throughout South Africa, and if it is likely to prove troublesome in dams, the water should be drained off, if possible, and an attempt made to uproot the underground rhizomes.

The Noxious Weed Inspector in Natal forwarded an unnamed species of *Opuntia* and was advised to carefully watch the spread of this plant as it is quite possible it may become a pest.

From Rhodesia and Portuguese East Africa a new leguminous tree has been recorded and recently described as *Dialium Simii*, Phil.

The District Forest Officer in Zululand forwarded a shrub from the native forests, said to be very common. It proved to be an undescribed species of *Xylotheca* (*X. Kotzeii*, Phil.).

TOBACCO AND COTTON.

Cotton in Zululand.—During September the Chief of the Division toured Zululand and Swaziland with a party studying the soil and climatic conditions of those areas, relative to their suitability for agricultural development. The greatest amount of progress in agriculture was shown at Candover Estates and Pongola Estate where, next season 3000 acres are being prepared for cotton culture. Goss Estate in the same area will have approximately 1000 acres, and, with other smaller properties, will bring the cotton acreage of that area up to 5000 acres. Several big ranching companies in Swaziland, engaged principally in the production of beef cattle, were visited. One of them had about 500 acres under crops, and further considerable agricultural development is imminent.

Cotton Breeding.—At the Rustenburg Experiment Station the selected seed plot of three acres gave lint averaging $1\frac{3}{16}$ inch, while the remainder of the crop ranged between $1\frac{1}{16}$ to $1\frac{1}{8}$ inch, and the report on the grade was good. The variety was Improved Bancroft. This shows conclusively what will be done when a plant breeder can devote his whole time to the improvement of the cotton crop. Mr. Pullen, who is at present specializing in the study of cotton breeding, will have charge of this line of work, when he has completed his studies.

Wild Fire.—Complaints are already being received of attacks of wild fire in tobacco. If this disease continues to spread, the necessity of sterilizing the seed before sowing, as announced by this Division more than a year ago, will be forced upon us.

British Cotton Growing Association Competition.—The following are the winners of the British Cotton Growing Association's competition for the best fields of cotton grown during 1920-21:—

50 *Acres.*

1st prize ...	Balman & Hannan	Total score	81·25 per cent.
2nd „ ...	Tugela Estates, Ltd.	„ „	70·73 „
3rd „ ...	S. N. Spear ...	„ „	68·21 „

10 *Acres.*

1st prize ...	I. M. Marwick ...	Total score	81·06 per cent.
2nd „ ...	R. Henshall ...	„ „	77·20 „
3rd „ ...	C. C. Swardt ...	„ „	75·39 „

THE SCHOOLS OF AGRICULTURE AND EXPERIMENT STATIONS.

GROOTFONTEIN, MIDDELBURG (CAPE).

Annual Sale, Grootfontein.—The annual sale of pedigree stock was held on the 15th September last. The prices obtained were generally speaking, somewhat better than had been anticipated in view of the present depression, and the main feature of the sale was the prices obtained for Tasmanians and Wanganellas. One Wanganella stud ram, sired by Elsenburg Admiral, was purchased for the sum of £140. Only on one previous occasion has a higher price been obtained for a ram. The demand for Karakuls was not too good, although from recent reports there would appear to be good prospects of a trade in skins developing with the United States and Canada, while there is also a possibility of an export trade developing in these sheep.

The Friesland bull, Grootfontein Alfonso, sired by Craigie Alf, was sold for £195, which is considered a bargain. The total realized was £1882. 10s., which compares favourably with the sale for 1921, when a larger number of stock was sold.

Export of Eggs.—Great strides have been made in the poultry industry in the past few years in the area served by the School, and it is gratifying to note the attention given to utility birds. The movement in the direction of poultry exchanges is one which should go a long way to building the industry on a sound foundation.

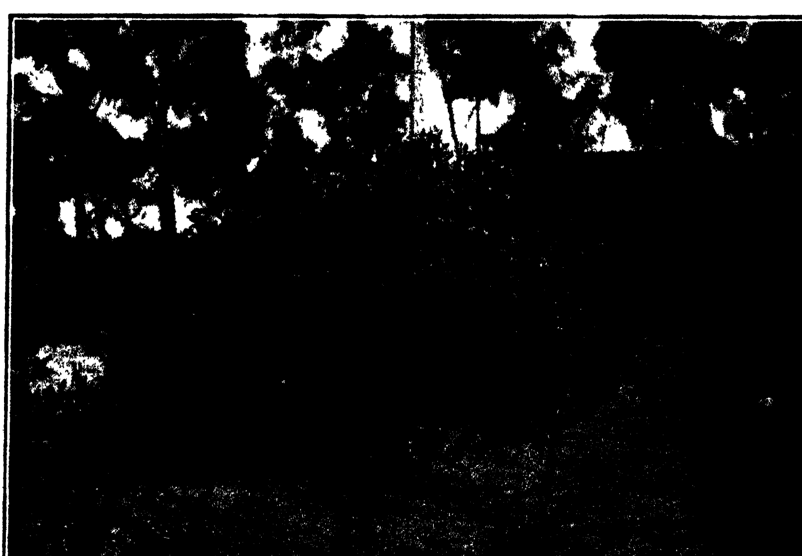
The 24th September marks a distinct advancement from the economic standpoint, for on that day the trial consignment of 101 cases of eggs was shipped from Port Elizabeth to the United Kingdom. It was inspected by Mr. A. Owen-John, Lecturer in Poultry at Grootfontein, who also superintended the transfer to the cold chamber in the "Arundel Castle." The consignment showed a very good standard, and a test examination made after the cases had been put on board encourages the hope that on arrival in London, the eggs will be in excellent condition. If this consignment is well reported on there is every prospect of a considerable development in the export trade as far as the Eastern Province is concerned.

Ostrich Feather Industry.—In view of the serious state of the ostrich feather industry, every endeavour is being made to assist ostrich farmers in perfecting organizations with a view to promoting and fostering the oversea market for feathers. In this connection it is hoped to organize a tour through the ostrich farming area to assist in the scheme which has been put forward by the farmers in the Oudtshoorn district, under which an active campaign to popularize the ostrich feather is contemplated.

Steynsburg Wool Growers' Association.—A further step in the organization of the wool industry was achieved when, at a meeting of the Steynsburg Farmers' Association, held on the 13th September, a resolution was unanimously passed in favour of the formation of a wool growers' association. Mr. R. W. Thornton and Mr. D. R. Mellet, the Government Sheep Expert for the District, attended, and delivered addresses on the need for organization and the advantages to be derived from the formation of such an association. A provisional committee was formed comprising a representative from each ward in the District.

Chinese Lucerne.—On the 26th August the first crop of Chinese lucerne was obtained. These plots are now (25th September) ready to be cut a second time this season, whereas most of the other varieties, such as Russian, Provence, Grimm, etc., are not yet ready for the first cutting. That it is desirable to take the first cutting as early as possible in spring can readily be seen from the accompanying photographs:—No. 1 shows a stool of Chinese lucerne which was left uncut when the majority of the stools were cut on the 28th of August, while No. 2 shows the amount of growth made by a stool of the same variety between the 28th August and the 25th September. Judged by the usual standards, the stool in No. 1 would be considered fit only now for cutting, and yet this delay would mean the loss of the growth shown in No. 2. The last cutting, in autumn, was made on the 14th May. The above indicates the rapidity with which Chinese lucerne grows during the late winter and early spring in the Karroo.

No. 1.—Chinese Lucerne on 25th September.
Last cutting on 14th May.



No. 2.—Chinese Lucerne on 25th September.
This stool was cut on 28th August.

Phalaris Bulbosa.—The accompanying illustration of the growth of this grass on the 25th September is interesting. Practically all the growth (almost 2 feet) was made during the winter. This is a valuable grass for the Karroo, as it is quite unaffected by frost.

Wheat Experiments at Bathurst.—Some 1300 varieties of winter cereals were planted between the end of April and the last week in May, and since that time rain has fallen on 24 days, while the weather has been dull and overcast for 50 days. The temperature has varied from 44° to 90°, and misty nights and heavy dews have prevailed throughout. A few of the "sunset" crossbred varieties were in ear in ten weeks. Certain varieties of wheat and oats have been badly attacked by rust, but it is too early to submit the results of all experiments. There are, however, indications that at the end of the season valuable information will have been acquired in regard

No. 3.—*Phalaris bulbosa* on 25th September.
Shows growth made during winter.

to rust-resisting qualities of different varieties, as it is considered that varieties which approach maturity under the adverse conditions at Bathurst, should be successful over the greater part of the wheat-growing area of the south-eastern coastal belt.

Special Sheep and Wool Courses for Members of Wool Growers' Associations.—Special courses, extending over a period of from three to five days, have been arranged for the purpose of instructing the members of the newly-formed Wool Growers' Associations in the purely practical work of picking, throwing, skirting, rolling, and classing the fleeces according to the standards agreed upon by the Middelburg and Graaff-Reinet Wool Growers' Associations. These courses should ensure uniformity in classing and packing by members of these associations.

Five courses have been arranged of which three have already been held. During each course from 100 to 150 sheep were shorn each day by the regular students at the School, who also received instruction on the same lines as the farmers attending the special course.

It is the intention that these special courses should be confined to farmers who have had considerable experience in sheep farming, and who can therefore readily assimilate the technical instruction, and it is useless for those who have had little or no experience to think of attending them. Each year a special course is held at Grootfontein extending over a period of seven months, which is devoted entirely to instruction in sheep and wool, and even this period is barely long enough for equipping the prospective sheep farmer with the necessary knowledge and experience, notwithstanding that each student receives individual attention, and that it is a condition of acceptance for this course that an applicant should have some knowledge and experience of sheep or wool. Furthermore, until a student has assisted in the "get up" of some three or four clips, he cannot be regarded as thoroughly proficient.

Farmers who have attended the course now being held include most of the leading sheep farmers in the two districts concerned. These courses have been of very material assistance to the members of the two associations. The main achievement has been the uniformity of classification of the wool, which should result from the many association members who attended these courses, while the regulations framed by the associations should now be uniformly interpreted by all members.

The thanks of the school are due to Mr. J. van Ryneveld, of Tafelberg Hall, who readily agreed to the whole of his flock and stud sheep being shorn at the School for the benefit of the students, as the school flock was not large enough to maintain the full supply of fleeces.

POTCHEFSTROOM, TRANSVAAL.

The Stacking of Cereals.—There are two kinds of stacks usually made in stacking wheat, etc.: the four-sided and the round. The latter is chiefly found in the Western Province, while the former is most commonly used in the eastern portions of the Orange Free State, where the summer rain necessitates the making of stacks capable of allowing the water to run off freely. As the Western Transvaal is similarly situated, the four-sided stack is recommended. The usual size for such a stack, holding about 10,000 bundles, is 8 yards by 4 yards. The most important points to be observed in making it in our climate are: (1) Keep the centre well up; do not allow your stack to become level or hollow in the centre, as, when the stack settles, the butt ends of the straw will stand upwards, thus enabling the rainwater to run "into" instead of "off" your stack. (2) Do not fail to let your sheaves bind properly; that is to say, the sheaves of the inner rows must always overlap the outer, to prevent slipping, which would probably cause your stack to fall. (3) See that your bundles are well tied; this will ensure a good stack being made (in addition to avoiding considerable annoyance) and save time and money.

Building the Oblong Stack.—In laying out your stack, say, for 10,000 bundles, mark off four corners, 8 by 4 yards. Then place a row of sheaves on end down the centre, starting and ending about 1 yard from the end; then place with the ears resting about just above the bands a row on either side and at the ends. This operation is continued until you have completed the foundation of your stack, which would then in the centre be the length of a sheaf high, sloping down to the thickness of a sheaf on the side and end. You then start your first layer from any point on the boundary of the stack; push the stubble end or butt firmly in behind the band, holding the sheaf at the same angle as the slope or pitch of your stack, continuing until a row (see section of stack, Fig. I, A) on the outside of the stack is completed. The second and subsequent rows running close up to the centre of the stack are placed with the ear ends overlapping the previous row in order to enable the slope of the stack to be maintained to allow for binding. At about a distance of two-thirds of the length of a sheaf from the centre of stack, place one row on either side of the centre with the stubble ends against the previous row (Fig. I, B), so that the heads just overlap one another. The last row is then placed to cover the overlapping heads, with the stubble ends alternately to one side and the other (see Fig. I, C). Once your

Fig. 1

Cross Section of Stack.

stack has got a good slope, the inner rows can be placed on subsequent layers of sheaves with stubble ends together, and heads overlapping one another, but as soon as the stack begins to lose its pitch heads must be placed overlapping the stubble of the previous rows as in first layer, Fig. I. This will immediately raise the stack in the centre.

The corners of a four-sided stack should be slightly rounded, and to obtain a desirable shape it is necessary to start drawing the heads of the sheaves slightly away from the corner, commencing four or five sheaves away, to make room for the corner sheaf (see Fig. II). The heads of the sheaves will overlap one another slightly. Care should, however, be taken in putting down the sheaves of the inner rows at the corners, so that these do not overlap too far (Fig. II, B), as otherwise the stack will become too steep at the corners. In this way the symmetry of the stack will be maintained.

By placing the stubble ends behind the bands of the outer row of each layer, the stack is gradually being drawn inwards, growing narrower as the stack grows higher. When the width of the stack

has become about 10 feet or when it is getting too high, the head should be put on. All the above measurements would vary according to the length and thickness of the sheaves.

The construction of the head is similar to the rest of the stack, excepting that the centre sheaves are laid lengthways along the centre line of the stack and not across it (Fig. III, A).

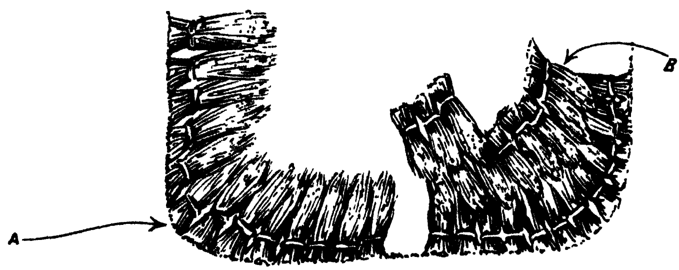


Fig. II.

Corners of Stack.

The ears of the rows of the sheaves from either side of the stack will soon begin to overlap (Fig. III, B). As soon as a row overlaps the previous one by about a foot, the stack is completed (see Fig. III, C).

Sometimes it is preferable putting the last two rows with the ears hanging downwards, but this is not essential.

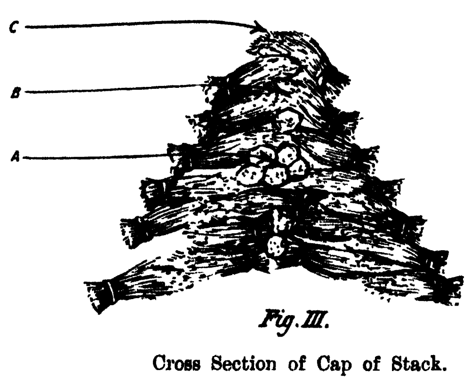


Fig. III.

Cross Section of Cap of Stack.

It is not advisable having more hands on the stack than is absolutely necessary; on a large stack four men, and on a small one two are enough.

In finishing off, it is advisable to fasten the cap down by pinning the sheaves with wooden pegs not more than ½ inch thick; this also applies to a four-sided stack, when the end bundles of the top layer may be pinned down, and in addition the bundles joined together by taking a small handful of straw from each bundle, and pushing this under the band of the adjoining bundle.

The Round Stack.—The round stack should resemble a rondavel. A stack 6 to 7 yards in diameter will hold about 10,000 bundles. Mark off the ground, place a bundle on end in the centre, place around this as many bundles as will fit in nicely, leaning against the centre one with heads slightly above the band, at an angle of about 72 degrees; in other words build a shock. Pack round this in the same manner as in a four-sided stack, until you reach the outer circle of your stack, when the butt end of your sheaves should lie flat on the ground with the head resting on the previous row. This completes your foundation. By placing your outer layers on the bands you will gradually draw in your stack until the summit is reached. For the top or last layers the heads of the sheaves will overlap one another at an angle; that is to say, the ears of each sheaf practically cover the previous one, so that the last sheaf placed covers all the rest.

Analyses of Rock Samples from Harding.—In view of the importance of phosphates in South Africa and the search always being made for them, the following results of a few analyses of some rock samples received at this Institution from Harding are interesting. The analyses were undertaken to determine their phosphate content. Their partial composition on a water free basis is given below, and was ascertained by the assistant chemist, Mr. J. J. Vogel, M.Sc.

	Sample "A."	Sample "B."	Sample "C."
Insoluble matter	31·14	33·80	40·70
Iron oxide	14·33	12·74	12·47
Alumina	8·73	8·24	8·63
Calcium oxide	10·04	11·71	9·20
Phosphoric oxide	5·48	5·91	6·02
Carbon dioxide	2·20	——	——

These samples resemble in composition some of the Weenen rocks which are found in a similar geological formation. Their phosphate content is low, and their iron oxide and alumina content twice as great as the lime content. They are of little value commercially on account of their low phosphoric oxide and their high iron content.

Fertilizing and Manuring of Maize.—Maize, like other plants, takes up a certain amount of mineral plant food from the soil. If the mealie plant is burned to a clean white ash, the minerals, without which the plant will not grow, may be weighed. This ash contains, among other things, phosphates, potash salts, and carbonate of lime. One important substance which the mealie plant takes up from the soil is lost in burning, i.e. nitrogen.

From the fertility point of view the nitrogen phosphates and potash are the most important of these four. Maize can get along very well with little lime. Seeing that ten bags mealies can take the following amounts of plant food from the soil, it is easy to believe that no soil is inexhaustible, and the average South African soil contains only 1300 lb. of phosphoric oxide per acre in the first $6^2/_3$ inches:—

Mineral Plant Food removed by Ten Bags of Maize.

Nitrogen.		Phosphates reckoned as Phosphoric Oxide.		Potash.		Lime.	
Total crop	Grain only	Total crop	Grain only	Total crop	Grain only	Total crop	Grain only
52	36	42	30	30	8	6·0	0·6

In fifteen to thirty years, if nothing is applied to the land, the yield decreases greatly. The secret of success is to keep up the fertility of the land by farm manures and phosphates.

Kraal or stable manure is a cheap and excellent source of plant food, as it contains nitrogen, phosphates, potash, and lime. In the soil, however, the nitrogen and potash are in excess of the phosphates, and this is unfortunately the case also in the farm manures. These, therefore, give best results when reinforced with phosphates: 200 lb. of superphosphates to 2 tons of manure for an acre is a good mixture. In areas of high rainfall more manure can be used. If too much manure is used, it supplies too much nitrogen, producing very leafy plants, which "burn up" in a drought, i.e. suffer from lack of moisture, because they use more than an unmanured plant by reason of their extra leaf growth. Phosphates alone as superphosphates or bone meal or a mixture of the two do not cause a "burning up," but develop good strong roots, which help the plant to withstand the drought, and still produce grain. A mixture of 50 lb. of bone meal and 150 lb. of superphosphates is a good mixture per acre.

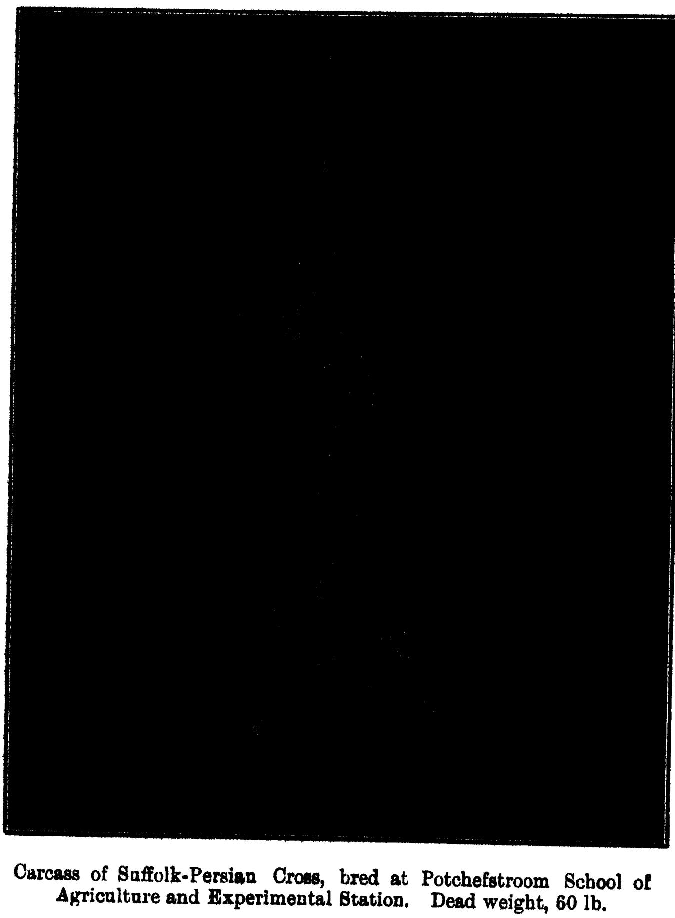
The maize grower is not advised to buy complete fertilizers, but rather to make use of phosphates and farm manures. Where he cannot get farm manures, then "green manuring" should be practised. This consists of ploughing under any green crop and allowing it to decompose in the soil. In the drier maize areas it is better to feed off this crop, usually a legume, or cut it for hay. Then plant the land with maize the next year, and give a 200-lb. dressing of phosphate per acre.

Another important subject is crop rotation. It has been proved time and time again that it is very bad to grow the same crop year after year on the same soil. A crop rotation lessens insect pests, and as different plants feed at different depths it helps to bring up the available or soluble plant foods from the various layers of the soil. A crop rotation should always include a legume, and some of the crops should get phosphates. A rotation suitable for high veld and middle veld areas is teff, cowpeas, and maize. The phosphates are applied only to the maize. The cowpeas and teff are cut for hay. The cowpeas give a dry-land hay equal to lucerne hay in feeding value. Any suitable summer crop may be substituted for teff.

Lime is cheap, but it does not pay to apply it to mealies, as they grow well on sour soil.

Unless the land is ploughed and harrowed well, and the crop kept nice and clean, fertilizers will not help much. But if this is done much better results and heavier cobs will result than where phosphates and a little manure have not been used or where legumes have not been planted in the rotation.

First Cross Suffolk-Persian Sheep.—At the recent Witwatersrand Fat Stock Show, Mr. W. Eaton, President of the Witwatersrand Master Butchers' Association, carried out a slaughtering demonstration on several types of sheep under the auspices of the Meat Exchange. The sheep supplied by this Institution for the demonstration were two full-grown first cross Suffolk-Persian sheep, which were in the winning pen at the above Show. They were taken off the veld in July and allowed to run on the lucerne lands during August, otherwise they were not specially fed on concentrates prior to the Show.



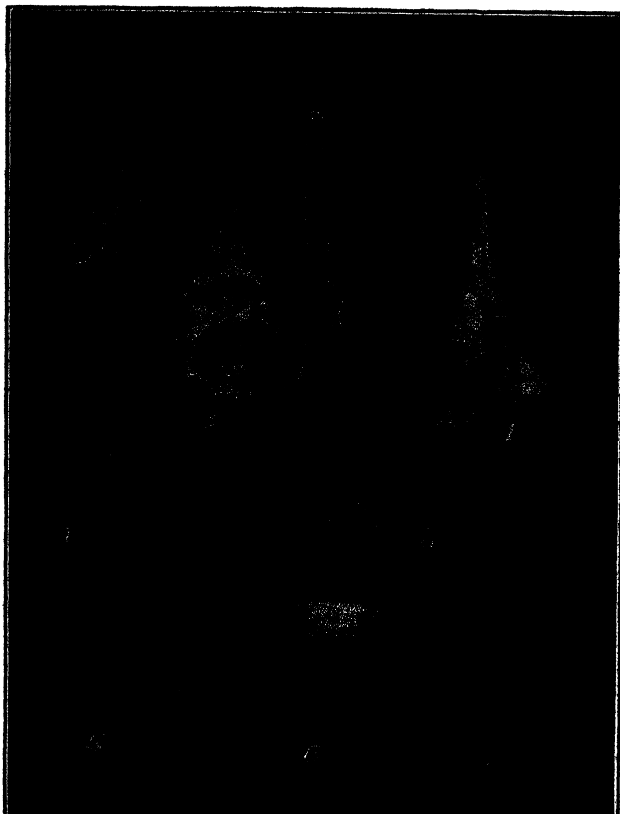
Carcass of Suffolk-Persian Cross, bred at Potchefstroom School of Agriculture and Experimental Station. Dead weight, 60 lb.

Mr. Eaton has furnished the accompanying photographs, and the following is extracted from his report:—

"The photographs will prove the value of this class of sheep from the butcher's point of view: the quality is most excellent and everything that could be desired. One photograph shows the whole sheep weighing 60 lb. (which is perhaps a little on the heavy side); in spite of this weight, the meat showed an abundance of lean flesh, and especially in the chops, which were large and most saleable, with no waste fat.

The following weights of one side of the sheep and the other in joints, show that no waste whatever occurred. On cutting the sheep in half both halves weighed 30 lb. I cut into the usual joints (English fashion) to see how the side cut out, with the following gratifying results:—

Leg: Full of flesh, small in bone, 7¾ lb.
Loin: Cut into 28 very saleable good chops; total weight, 7 lb.
Shoulder: Also of very excellent quality, full of meat and likewise small in bone; weight, 5½ lb.



1. Breast, 6 lb. 2. Shoulder, 5½ lb. 3. Side, 30 lb. 4. Leg, 7¾ lb. 5. Neck, 2 lb. 6. Loin, 7 lb. 7. Suet, 1¾ lb.

Neck of mutton, or "scrag-end": Only weighing 2 lb., very thick in flesh, and a ready sale was effected.
Breast: Very thick, full of flesh nicely mingled with fat, and very saleable; weight, 6 lb.
Kidney suet: 1¾ lb.

This works out at exactly 30 lb., making the total weight of the sheep 60 lb., showing thus no loss in cutting out, which speaks for itself, and is a great improvement on the ordinary slaughter sheep seen in the markets to-day.

In my opinion they are the finest and most profitable class of sheep I have cut up since I have left London, and production of such should be aimed at, as they would undoubtedly find a ready sale and command top market prices both in South Africa and overseas. Several of my customers who had the mutton had nothing but the highest praise as regards the quality and flavour."

GLEN, ORANGE FREE STATE.

Cropping System for the Small Farmer.—Though much has been written concerning the value of rotation in maintaining the yield, and of the value of the diversity of crops for the sake of greater security, very many farmers still confine their attention almost entirely to maize.

Though to the large farmer in certain areas this restriction of activities largely to one crop may be profitable, there is no doubt as to the folly of the practice for the small farmer. The rainfall over a great part of the maize-growing areas is notoriously unreliable, and it must be small comfort to any unfortunate farmer to be able to blame the weather for his failure to make good. Moreover, if the crop is successful, the amount of profit it can produce in a limited area is not very great. One hundred acres of maize with a yield of six bags per acre—and the majority of farmers are not getting as much this season—with 2s. 6d. profit per bag (those generally who had to sell at 10s. or thereabouts did not make this profit) results in only £75 profit—hardly a living wage for a farmer. Double this profit could be derived from the same area if a proportion of fodder crops was grown and fed on the farm, especially if a legume be included in the cropping system. Our animals need the nitrogen supplied by such legumes as cowpeas, velvet beans, soya beans, kaffir or other beans, and our soils are usually benefitted by growing them; yet farmers persist in excuses for not making a success of them. Some two or three hundred years ago clover helped to make English farming, lucerne has made the Argentine a successful cattle-raising country, and cowpeas and other legumes have now become a regular constituent of the United States cropping system; yet there are South African farmers who think they can succeed without the aid of legumes.

Stalk Borer.—One feature has particularly struck the notice of the officer in charge of the cost of production of maize investigation on his itinerary, and that is the great amount of damage caused to maize by the stalk borer, and the vulnerability of the crop to its attacks when no measures of prevention are used. Mally, in his Bulletin No. 3 of 1920, has detailed fully the methods which may be used, and farmers are aware of the liability to attacks of the pest and the damage it may cause them, and yet they seldom take any steps either for prevention or remedy. Trap crops are but one of the methods recommended by Mr. Mally, and according to him should be used as supplementary rather than control measures. Nevertheless on those farms where stock, especially dairy cows, are kept they will constitute an economical method of attack in that the trap crop will be a valuable feed either for soiling or silage. Farmers who have grown catch-crops of maize primarily for feeding green to their cattle have found greater freedom from stalk borer in consequence.

Extension Work.—Persons otherwise well informed often have little or no personal knowledge of the Schools of Agriculture in their area and the facilities they offer. Probably one of the most effective ways of keeping the farming public informed of the best methods to be followed and bringing them into touch with the local agricultural education and research institution and organizing them, is by means of the country agent. At any rate it is maintained in the United States that the country agents have been the most effective means of establishing a contact between the scientific workshop and the farm. In South Africa country agents have not yet been appointed, and other means have to be employed for making known the facilities offered in the way of education, research, and advice by the various Schools of Agriculture. At Glen every opportunity has recently been taken of making visitors to Bloemfontein acquainted with the work and function of the school. In May last a party of 70 members of the Dutch Reformed Synod were invited to Glen, and in September 150 members of the Presbyterian Church Congress were shown the various sections with their stock and equipment. Towards the end of the month 70 delegates of the Associated Chambers of Commerce visited Glen and left it equipped with some of the properties of a country agent; it is hoped that they will make full use of their exceptional opportunities of making known the school and the facilities it offers. Commerce and agriculture are mutually interdependent, and any progress in agriculture is reflected to an equal extent in the commerce of the land.

The Value of Subsoil Inspection.—Two questions which have always to be answered by farmers who send samples of soil for analysis or who want advice on a particular soil, are: "How deep is the soil?" and "What is the nature of the subsoil?" It is surprising that a large number of farmers cannot answer these questions with any certainty, even if asked with reference to a cultivated soil on their own farm. It has often happened that the chemist, when visiting farms, is shown a patch of lucerne that will not thrive or an orchard which is dying off, or "something wrong" with one or other deep-rooted crop. Of course the first questions he asks the farmer (if necessary) are the two mentioned above; and more often than not the solution of the problem has thus been found. So much of the agricultural value of a soil depends on its depth and the nature of its subsoil that subsoil inspection can never be too strongly recommended. It is obvious that for a deep-rooted crop there must be a deep soil, or the subsoil must be sufficiently penetrable and contain sufficient moisture, air, and available plant-food to allow of proper root development. Many trees and other plants will send their roots deep into a limestone subsoil, whereas the same root will not penetrate into the soft but "dead" and compact clay subsoil found beneath many soils. Similarly a gravelly subsoil might be more desirable than one consisting of fine silt and clay, and rich in plant-food but not sufficiently aerated. Questions about soils which "dry out rapidly" are often asked. In most cases the cause has been traced to the nature of the subsoil. To know the physical nature of a soil down to its bedrock foundation is worth more than the results of a chemical analysis of the first few inches of surface soil.

Agricultural Education.—Now that attention is being directed to agriculture in primary and secondary schools, and in view of the arrangement recently made whereby the Diploma of the Glen School of Agriculture is accepted as a qualification examination for the Higher Primary Teachers' Certificate Examination, the invitation extended to this Institution to put up an exhibit at the Exhibition of School Work arranged in Bloemfontein by the Orange Free State Teachers' Association was cordially welcomed. Exhibits representing the experimental, engineering, horticultural, chemical, entomological, dairy, and sheep and wool and domestic science sections, and chosen to illustrate the educational side of the work, were made.

Special Course in Dairying.—The Special Course in Dairying which commenced in January last, terminated on the 6th October. The new course commenced on the 11th October, and is expected to continue until 30th September, 1923. The students leaving the school have been examined in the theoretical portion of their work and in testing; and they now have to complete six months in an approved factory before being finally examined on their practical work. Managers of creameries who realize the value of trained men are asked to assist these students to obtain their certificate by offering to engage them for the specified period at a nominal figure.

In the Poultry Division.—School of Agriculture, Potchefstroom, Transvaal.

Faulty Fruit Boxes.

The Trade Commissioner reports that there have been certain marks of oranges consistently unsatisfactory throughout the past export season, many of their boxes arriving split in half. This was due to the use of two-fifth inch plain, frail strapping instead of the usual half-inch self grip. The use of the former strapping should immediately be discouraged, as such poor material is incapable of withstanding the wear and tear of handling.

FURTHER HINTS ON THE CASTRATION OF ANIMALS WITH THE BURDIZZO PINCERS.

By DR. F. VEGLIA, Division of Veterinary Education and Research, Onderstepoort, Transvaal.

SINCE the notes upon the use of the Burdizzo pincers were published in the August, 1921, number of this Journal, further observations upon

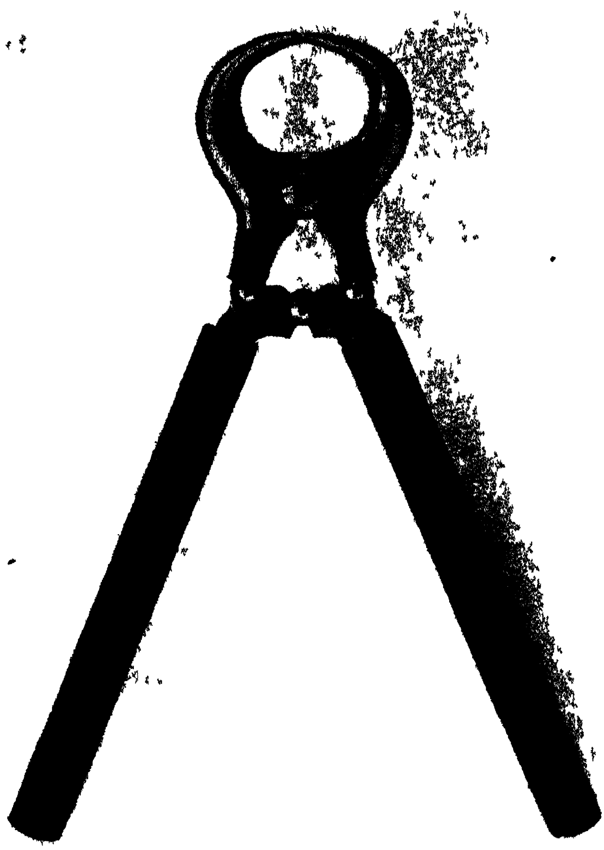


FIG. 1.—The "Burdizzo pincers" with the piping extension.

their manipulation and efficiency have been made. Castration with these pincers has been systematically carried out on cattle, sheep, donkeys, pigs, and dogs, and the previous general instructions for use still hold good. The purpose of the present notes is to suggest a few improvements in technique and answer a few questions raised in correspondence with farmers.

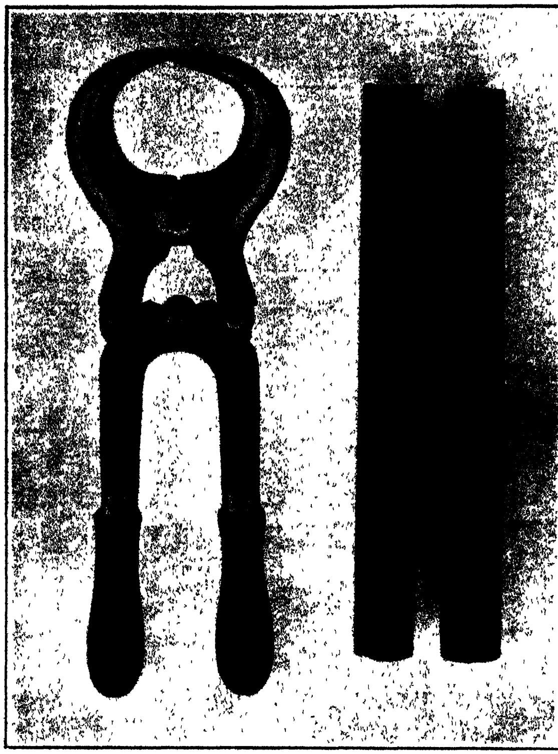


FIG. 2A.—The original handle length of the pincers and the piping extension.

FIG. 2B.—Kuch's modification of the original Burdizzo pincers showing leg-grip.

FIG. 3A.—Scrotum of a lamb two weeks old operated on with the pincers.

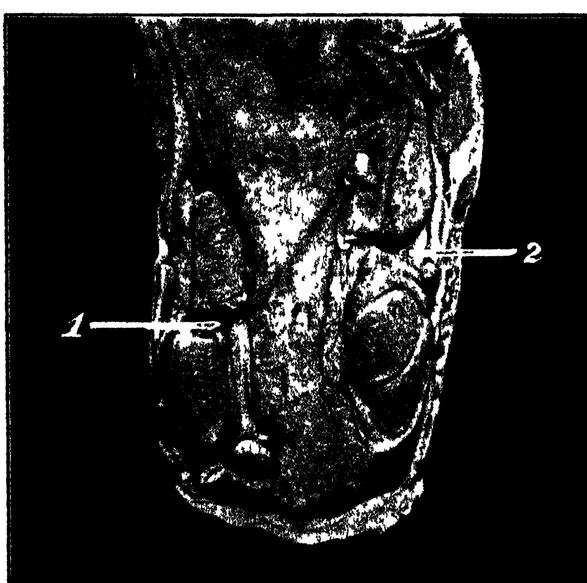


FIG. 3B.—The same bag cut open to show the testicles completely severed from the cords (1 and 2).

The instrument was originally designed for European cattle, but it has been found that bulls reared upon the open veld in this country generally show a thicker scrotum, and that for bulls over two years old the closing of the pincers on the testicular cords can be facilitated by the use of the extensions to the handles shown in Fig. 1.

These extensions simply consist of tubes about 10 inches in length, and of 1½ inch internal diameter. They can be slipped on whenever greater leverage is required, and easily removed again when the pincers are used for young calves or sheep, as shown in Fig. 2A.

In Brazil, where conditions are similar to those of the Union, and where the Burdizzo pincers are widely used, the same type of

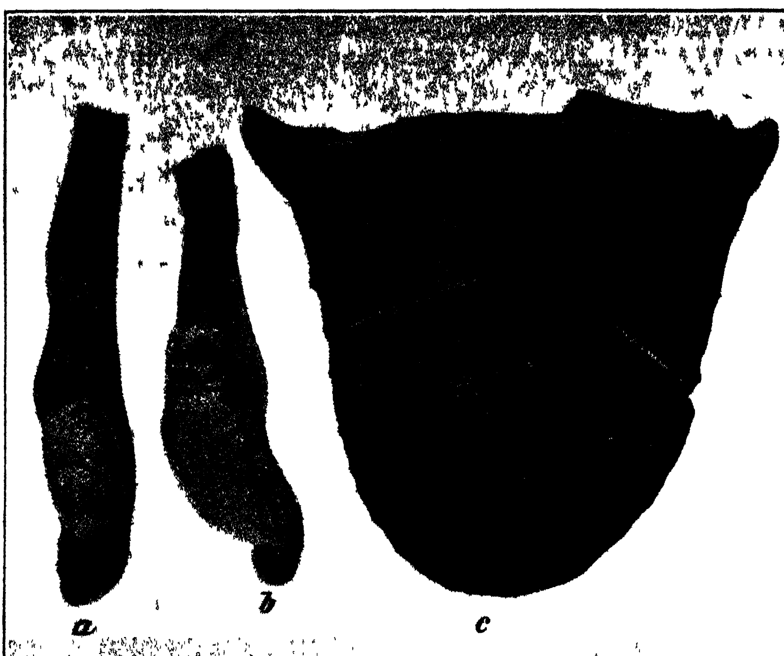


FIG. 4.—c Testicular bag of a calf 10½ months old, which was castrated with the pincers three months before its death. *a* Atrophied and dead testicle of same calf, compared with *b*, which is a normal size testicle from a calf one month old.

extensions are adopted for the handles. Kuch, however, has recently described another useful modification of the instrument, in which the handles are lengthened, and a bow-shaped knee-support constructed upon the end of one of them. This device affords a better grip, and steadies the pincers during compression of the cord when the operation is being undertaken by one man. This type, as illustrated in Fig. 2B, is now advertised for sale.

In South Africa, where the farmer can generally get an assistant to hold the testicular cord during the operation, the simple pipe extensions, lengthening the handles by 3 to 6 inches, will generally meet all requirements, but for the man who prefers to undertake the

operation unaided the modified instrument of Fig. 2B offers undoubted advantages.

Farmers have sometimes asked how the cords can be crushed under the bag without cutting the skin, and it may therefore be explained that the technique of the operation is based upon the difference in resistance to pressure between the tissues of the scrotum and of the testicular cord. The skin of the scrotum, and the fibrous membrane *(Tunica vaginalis)* containing the cords, resist the pressure of the pincers (Fig. 3A, Fig. 4 *a*, Fig. 6 *a*, *b*, *c*), while the blood-vessels and the spermatic ducts of the cords are crushed and obliterated (Fig. 3B and Fig. 6 *a*, *b*, *c*). The blood circulation is thus destroyed, with the result that the testicles die as soon as the operation is completed. Haemorrhage is limited to a small clot of blood, since bleeding into the bag *(Tunica vaginalis communis)* is prevented by the fibrous membranes of the cord *(Tunica vaginalis propria)*.

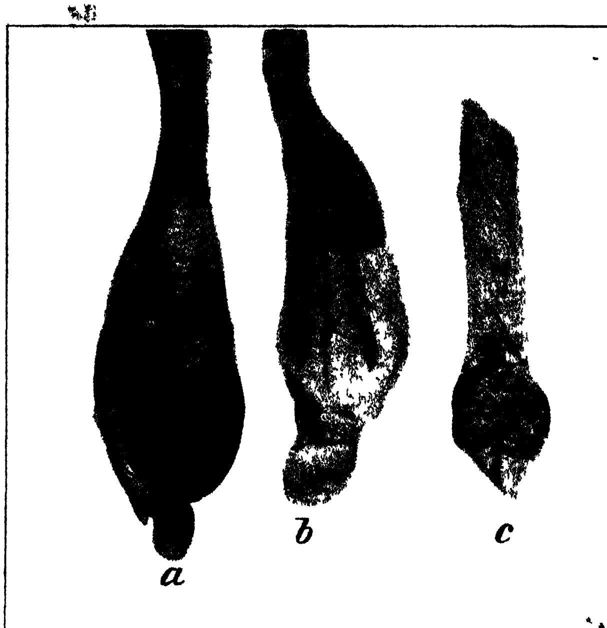


FIG. 5. – *a* Testicle of a 20 days o'd lamb, three days after castration. (The testicle is congested, the cord is swollen.) *b* Testicle of a 3 months' old lamb, two months after castration. (The testicle is shown cut open. The vital part of the gland was reduced to a thick turbid liquid.) *c* Atrophied testicle of a lamb 6 months old, which was castrated three months before death. (The testicle replaced by a lump of fibrous tissue and fat, the size of a coffee grain.)

Farmers have also inquired why it is that the testicles are withdrawn in the scrotum immediately after crushing the cords. The reason is that the red muscular band which runs along the testicular cord is not cut by the pincers, and on contraction causes a sudden ascent of the testicles. The obstructed circulation of the blood in the testicular tissue (passive hyperaemia) is soon followed by an intense "haemorrhagic infiltration" on the day of the operation (Fig. 5 *a*).

Degeneration of the testicles then commences, and the most vital parts (convoluted seminiferous tubules) are converted into fatty masses (fatty degeneration). As time goes on, the whole glandular substance is reduced to an opaque greyish or yellowish tuft. This "necrosis of the testicle" takes some time, but the dead tissues are finally absorbed, leaving only a small hard irregular "nut" of fibrous tissue (fibrous atrophia, Fig. 5 *b*, *c*). This explanation makes it easy to understand why the "dying out" of the testicles is slower in old animals than in young ones. In the older animals there is of course more glandular substance to be absorbed, and the proportion of fibrous tissue is

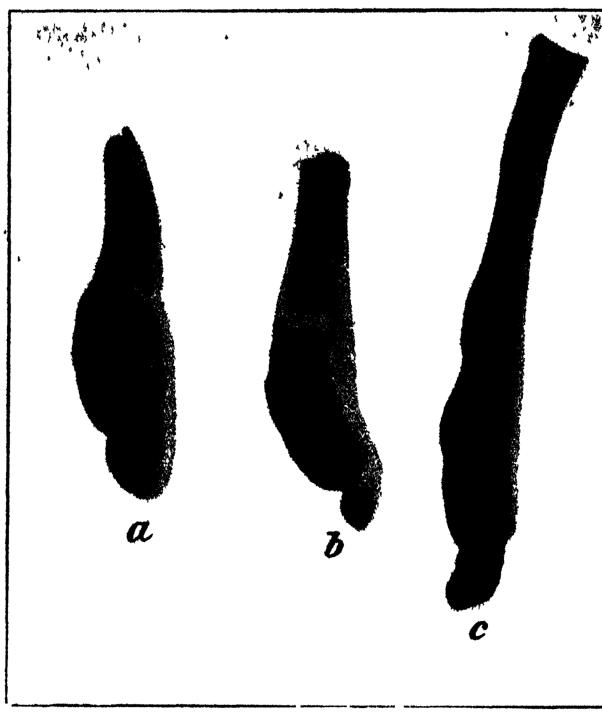


FIG. 6 (¾ natural size).—*a* and *b* Testicles of two calves 1 month old, which were operated on with the pincers. The pincers were closed on the scrotum, and no attempt was made to push up the cords, which on dissection showed to be completely severed. *c* Testicle of a calf 10½ months old, castrated three months before death. The cord was found to be cut right through, leaving a gap half an inch wide.

greater. But long before atrophy is complete, retraction of the testicular cords occurs. The testicles are pulled up to the margin of the "inguinal canal," and the scrotum is reduced to a small shrunken fold containing a handful of fat.

In the instructions for castration by the Burdizzo pincers, given last August, the recommendation was made to push up the cord of the testicle as soon as this was seen to be severed by the closing of the pincers. This procedure is still advised, and becomes quite easy after a little practice. When the pincers are closed on the scrotum

the bag should be gripped above the clamps and the cord itself felt for with the first finger and thumb. On pressure the nails of the thumb and finger will almost meet, being separated only by the double layer of skin of the bag. The cord should yield and go back about half an inch, so indicating that it is properly severed. (Fig. 3B and Fig. 6 *c*.) This procedure is not absolutely essential, but it is a wise precaution to make sure that the operation has been complete. It is seldom that any difficulty occurs, since the spermatic arteries and veins are very easily obliterated and the cord easily cut through. (Fig. 3B and Fig. 6 *a*, *b*.) In young donkeys (2 to 4 years old) the cord is particularly fragile and easily severed. In many cases the contraction of the muscular band withdraws the severed vessels about an inch, without the application of any finger pressure at all. It appears that the only cases in which the operation fails are those in which the cord slips away from the jaws of the pincers. In their first trials in securing the cords of old bulls and donkeys, farmers might make use of a pair of carpenter's pincers about 6 inches long, slightly modified for the purpose by a blacksmith, as shown in Fig. 7.

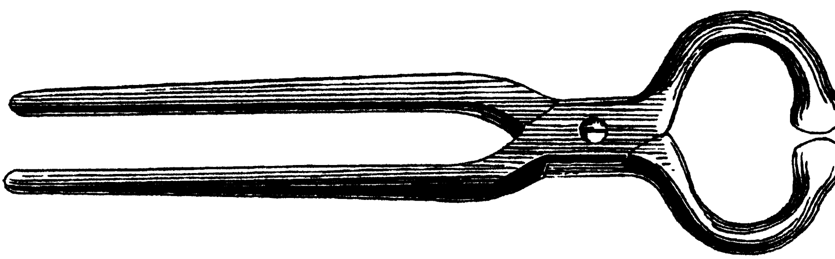


FIG. 7.—Carpenter's pincers, as modified.

It has sometimes been asked whether both cords can be caught at the same time by the pincers in the case of lambs. This can be done quite well, not only in lambs, but also in small calves, pigs, dogs, and cats, provided the operator is well acquainted with the operation and carries it through without hesitation. The clamps must not be left closed on the bag for long, and hence the whole job must be done quickly; otherwise there is the danger of the bag itself being cut through and falling off.

Since skill in any operation needs practice, farmers should practice with the pincers on *dead* lambs or bulls whenever they get the chance, either at a butcher's, or on animals which have died or are killed on the farm. In this way experience in handling the cords of the testicles can be acquired, with the advantage that the bag can be cut open afterwards and examined to see whether the technique has been efficient or not.

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ADVANTAGES OF THE SILAGE SYSTEM.

By E. PARISH, B.Sc., Vice-Principal, School of Agriculture, Glen.

THE BASIS OF DEVELOPMENT.

THOUGH the silo has been known in South Africa for at least twenty years, the progress made in silo construction and in the use of silage preserved in other ways must be considered very slow. There is, however, every reason to believe that if the great advantages of silage were more widely realized by stock owners there would be many more silos in use in the Union than there are to-day. We are accustomed to look forward to the time when this will become a great cattle country, excelling in the production of both milk and meat. In this connection it is safe to claim that one of the most important factors necessary to such a development is a sound system of feeding, and that the basis of this will be silage. There is probably no country where the making of silage promises greater advantages than in South Africa. As a feed for the winter season, which is both nourishing and succulent as well as cheaply prepared, silage is unequalled. It is also well suited for use in periods of drought, can be economically produced and stored, and is readily available when required.

The use of silage permits of more stock being carried per acre, and the returns from high-priced land are increased. Silage is mainly a cattle food and may be used in the production of either milk or meat. But there are possibilities, too, in connection with its use for sheep. Many losses of stock occur almost every year in some part of the country through drought and lack of pasturage on over-stocked areas. These might be greatly lessened if silage were provided in season.

AN EXTENDED MAIZE-BELT.

The maize-belt might be greatly extended when the crop is grown for silage, as a considerably shorter period of growth is required and advantage may be taken of late rains to plant for this purpose. Again, maize crops damaged by hail or frost and stunted by drought, as frequently happens, may be made into good silage. In the absence of silos, the use made of drought-stricken, frosted, and hail-damaged crops is practically nil. Every year there are considerable areas where the maize crop is partially destroyed by one of these three factors.

With reference to extension of the maize area in growing maize for silage, from one-fifth to one-fourth of the total area of the country has a rainfall of between 10 and 20 inches annually, and this is ordinarily insufficient for maturing a maize crop for grain. Where maize is grown only for silage this rainfall is usually enough to grow a crop giving a fair yield of fodder per acre.

EARLIER MATURITY OF STOCK.

With a wider adoption of the silage system and more winter feeding, especially of young stock, earlier maturity could be secured

in our cattle. The demand of the markets abroad is for cattle maturing at about three years of age, and the South African market is rapidly developing in the same direction. In a very short time the only cattle which will be of economical value for meat will be the breeds which mature at the age of three years or under, and the market for old, heavy cattle will be limited to the supply of meat for local trade.

ADDED VALUE TO DAIRYING.

The feeding of more silage would prove a great advantage to the dairy industry. At present, judged by creamery returns, the minimum winter supply is only approximately one-seventh of the maximum summer quantity. The prices offered by creameries for milk and cream is largely determined by the amount of the winter supply or by the ratio it bears to the summer yield. The high overhead charges during the winter season, when the supply is short, have to be met by a corresponding reduction in the prices paid for butter-fat and milk for the year. Any increase in such winter quantity and the corresponding decrease in the ratio between summer and winter quantities would tend to increase the price paid by the creameries throughout the year.

A GREAT INCREASE IN THE VALUE OF LIVE STOCK.

Allowing for the cattle which do not suffer as a result of deficiency of winter feed, for native-owned cattle (for which one cannot expect silage to be provided until the Europeans have adopted it more generally), and allowing also for old cattle, it is considered that it would be fair to assume that half of the cattle population of the country suffer through deficient winter feeding, and that on the average these would be worth £1 more per head per annum than under present conditions if they were provided with sufficient succulent and nutritious food. Half the number of cattle given in the 1920 Census is approximately 2,500,000, and at £1 per head the increased annual value as a result of feeding with silage would be £2,500,000.

With a similar calculation for sheep, excluding goats, and at an estimated annual increase and prevention of losses obtainable by provision of feed when scarce, especially in time of drought, at 2s. 6d. per head, the additional annual increment would be at least £1,500,000.

These calculations are on a very conservative basis and may be regarded as minimum figures. The total, however, is considerably over £4,000,000, and this, as an annual increment spread over 80,000 farmers, is equivalent to £50 per farmer per year, an amount which at the present time most farmers would be very glad to have added to their incomes.

The census returns for the last ten years indicate that the annual increase in the number of cattle has not exceeded 4½ per cent. This is very low for a young country not yet fully stocked, and compares unfavourably with the percentage increase for other countries. Canada during the same period shows an annual increase of 8 per cent. and New Zealand 6½ per cent. If silage were available every year no doubt the increase for South Africa would become much bigger than it is at present.

INTENSIVE POULTRY-KEEPING FOR TOWN DWELLERS.

By J. J. JORDAAN, Poultry Instructor, School of Agriculture, Glen, Orange Free State.

FRESH eggs in the home are always welcome to the housewife, and a boon when compared with the article that is sometimes bought and at times very difficult to obtain owing to excessive prices or limited supply.

The space available to keep poultry in many backyards is too limited for the semi-intensive system, that is a run with a house in it for the birds, nor is there the sufficient time required for the necessary attention, while free range is out of the question. On the other hand much useful egg-forming foods are often carted away in the form of kitchen scraps, such as cabbage leaves, onion tops, potato peel, etc.

For the purpose of ascertaining how best to help the town housewife to secure a constant supply of eggs (fresh) in her own yard, at the minimum of cost and labour, bearing in mind the limited space available, and utilizing all scraps from the table and kitchen, an experiment was carried out for twelve months at the School of Agriculture, Glen, Orange Free State, commencing on 1st April, 1921.

A house was made 4 ft. 6 in. wide by 6 ft. long by 4 ft. 6 in. high, framework of 1½ in. by 3 in. deal, except the corner uprights, which were 3 in. by 3 in. (for framework other wood available may be used such as wattle poles, blue gum poles, or spare timber if well treated with solignum or caroblineum before erection, or iron standards bolted together). The frame was covered with 1 in. wire netting, but open at the top. Half the length of the house (the back half) was covered from top to bottom, on the sides and back, and along the bottom front and at the sides of the front half 2 ft. high from the ground, with malthoid, so as to serve at the same time as a house for sleeping and to keep in the scratching material, and also act as a windbreak for the birds (but tarred bags may be used for this purpose, and will be more economical). In the back part of the house, on the cross pieces, 2 ft. 3 in. from the ground, a platform was fixed, and on this a tin tray fitted to hold sand; above this on either side a support of 1½ in. by 3 in., about 4 in. high, supported a perch 3 in. by 1½ in. on the flat; in the two corners at the back nests were made in a box 9 in. by 9 in. by 4 in. high.

Across the top, 3 in. under the lid at the two ends, a piece of wood 1½ in. by 3 in. is fastened; on this rests a wire-netting frame to act as a cover when the two lids are open for purposes of airing the

house. There are two lids 4 ft. 6 in. by 3 ft. over the run and the other over the sleeping part; these lids are also made of 1½ in. by 3 in., and are covered with malthoid. On the outside of the house at the front end, raised 4 in. from the ground on some bricks or such-like

End view of house with lids over run and house, also showing roost, nests, tin tray dropping board under perch, wire basket for green food and grit, and mash tins.

material are three or four paraffin tins as the case may be. Through the end of the house 12 in. up a horizontal slit, the length of the width of the house, is cut 3 in. wide; in the tins and 2 in. from their

top on one side a horizontal slit 3 in. wide is cut; this is put against the opening in the end of the house, and thus the birds can get their heads through and into the tins for their contents, but are unable to upset or foul them. One tin contains grit, shell, and charcoal mixed, another such mash food as may be given, the third water, and the fourth tin may be provided for table scraps boiled and dried off with bran.

Suspended to the centre cross piece of the frame inside the run is a wire-netting basket 9 in. by 3 in. by 6 in., into which all green food or table scraps are thrown. This prevents the floor being soiled or littered unnecessarily.

The whole floor of the house is used for scratching purposes by being kept dry and littered 12 in. deep with such scratching material as may be available, such as straw, hay, mealie stalks, leaves, etc. All grain food was thrown into this, and there was always sufficient to keep the birds busy by scratching for it.

The tins at the end were also always kept full of mash, water, grit, etc. Cleaning the house or dropping board (the tin tray) under the perch was done once a week from the top, the droppings being removed, and three times during the year fresh sand was put in the tray. The floor of the house was never touched or cleaned, only fresh straw or scratching material being put in as required. Feeding was done once a week, clean drinking water given, and the eggs gathered daily. In cold or bad weather both lids on top were kept closed; in fair weather the front one over the run was opened and kept raised by a supporting rod to admit sun and fresh air.

Six South African Utility White Leghorn pullets between six and seven months old were taken at random from among fifty odd bred at the institution and placed in the house for testing their capabilities in meeting the housewife's requirements as above outlined. The birds were never allowed out of the house during the year. Their egg production for the period is shown below, but it must be noted that they were not selected birds, as will be apparent to all poultrymen when it is seen that two went broody during the test. They were just ordinary South African Utility White Leghorn hens.

INTENSIVE TEST.

Record of eggs produced:—

May	108	November	151
June	91	December	132
July	129	January	102
August	120	February	115
September	156	March	133
October	166	April	67

Total, 1,470 eggs.

NOTE.—One bird was broody for four days (29th November to 2nd December). Another was broody from 10th to 21st January. The number of eggs laid per diem ranged generally from 1 to 6; on one occasion, 3rd January, 9 were laid.

EXPENDITURE.

The food consumed by the six birds during the year was accurately weighed, the quantities and cost being as follows:—

			s.	d.			s.	d.
70½	lb.	bran	12	5	per	100 lb.	8	9
39	,,	pollards	15	6	,,	,,	6	0
37	,,	oats	10	0	,,	,,	3	9
116½	,,	wheat screenings ...	10	0	,,	,,	11	9
54	,,	mealies	5	0	,,	,,	2	9
66½	,,	kaffir corn	8	9	,,	,,	5	10
36	,,	grit and shell... ...	6	9	,,	,,	2	5
16	,,	charcoal	7	6	,,	,,	1	2
5	,,	mealie bran	5	6	,,	,,	0	3
5	,,	crushed oats	10	6	,,	,,	0	6
400	,,	green food	4	2	,,	,,	16	8
						£2	19	10
Scratching material,								
300 lb.		grass hay... ...	4	6	,,	,,	13	6
						£3	13	4

Fractions have been overlooked.

Average per bird for twelve months 12 2⅓

REVENUE.

1470 eggs at 1s. per dozen...	£6	2	6
550 lb. manure at 3s. per 100 lb.	0	16	6
	£6	19	0
Average per bird	£1	3	2
Net profit over feeding cost, and scratching material	£3	5	8
Net profit over above costs per bird	0	10	11⅓

The average cost of producing the above 122½ dozen genuine new laid eggs was a fraction more than 7d. per dozen.

It will be noticed that no forcing foods were given, nor were any table scraps available or used, which would have brought down the cost of production somewhat by increased production and lower cost through less food being purchased. The conclusion drawn from the

test is that the housewife may, without much expense or labour, keep her own egg-producing hens in her backyard no matter how small, and have a supply of fresh eggs for the greater part of the year. There is of course the initial outlay of the cost of house and birds, but the latter may generally be exchanged or sold at the end of the year, and thus be replaced by new pullets.

A further test with the same birds is being continued for another twelve months to see if they are not able to produce just as cheaply and well as second year hens as they did as pullets; perhaps they can

Shows side view of the house, two lids open with the wire-netting frame on top to keep birds in when lids are open, and the six birds themselves.

be kept even longer, and prove that it may not be necessary to dispose of them at the end of the second year's laying.

On completing the test the six birds weighed 3¼, 3, 4, 3, 3½, 3¼ lb. respectively; total 20 pounds.

Essentials.—The birds must be of a laying strain. Food must not be allowed to turn sour. The floor must be kept dry. Insects must not be allowed to get into the house or on the bird's body.

CANNING VEGETABLES AND FRUITS IN THE HOME.

By Miss E. M. FERGUSON, Lecturer in Domestic Science, Elsenburg School of Agriculture, Mulders Vlei, Cape.

THE canning of fruits is a home industry in which almost every South African housewife is interested. Until within recent years not much thought has been given to the canning of vegetables in the home. The chief reason for this is due to the impression that vegetables "do not keep." This idea is quite an erroneous one. We only want to understand the fundamental principles underlying the process of canning to know that vegetables will keep as well as fruits if treated in the correct way.

It is not only desirable but necessary that our diet should contain some form of green vegetable or fruit every day, for these foods not only contain mineral salts and organic acids, which are necessary to the processes of growth and development, but they are a source of the vitamines or "soul of food" without which no living creature can exist.

In the long process of sterilization, especially in the case of vegetables, most of the vitamines are destroyed, but if these are served with a white sauce made of milk the deficiency may partially be made up. (Milk being a perfect food, contains the vitamines as well as all the other food constituents.)

During the season when fresh green foods are obtainable they are usually over abundant, so that this is the time when the energetic housewife will do all her canning to have something in store when the "lean" time comes in the winter. Foods are canned for the purpose of preserving them as nearly as possible in their fresh juicy condition.

It is a universally known fact that foods not properly preserved will spoil. They will ferment, decay, or become mouldy. These changes are brought about by the development of bacteria, yeasts, or moulds. If these micro-organisms can be prevented from growing the food will not spoil. Therefore the question of preservation either by canning or by any other method resolves itself into the problem of preventing these bacteria, yeasts, and moulds from growing and multiplying in the foods.

The surface of everything which is exposed to the atmosphere is more or less contaminated with these invisible micro-organisms. But before they can multiply and thus become active in the spoiling of foods, the conditions for their development must be satisfactory. The four requisites for their proper growth are:—(1) Food, (2) moisture, (3) warmth, (4) air. In the process of canning, our object is to kill all the micro-organisms present in the food, and then to prevent others from gaining access to the food by the exclusion of air.

CANNING FRESH FRUITS.

The micro-organisms to contend with in the preservation of fruits are mostly, if not entirely, yeasts and moulds. With very few exceptions bacteria cannot grow in fruit juices owing to the fruit acids that are present. Invisible yeast cells and mould spores are always present on the surface of fruit. They get there chiefly from the soil, which provides the necessary warmth, the food and moisture coming from the fruit which falls to the ground. The wind carries these yeast cells and mould spores into the air with particles of dust, and they are thus deposited on the fruit while it is growing. If soft fruits are allowed to stand for a few days after picking, particularly if they are damaged in any way, fermentation will set in and moulds will form.

The destruction of the yeast cells and mould spores present is brought about by the proper application of heat (sterilization), and others are prevented from getting to the material by hermetically sealing the fruit in glass jars or tin cans, etc. Fruit to be preserved should be sound, fresh, and under rather than over ripe.

Methods of Canning.—There are several methods of canning.

Method (1).—*The old-fashioned open kettle or stewing method*, where the syrup is made and the prepared fruit is cooked in the syrup

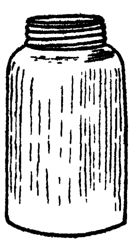


FIG. 1.
Atlas & Mason Screw-top Jar.

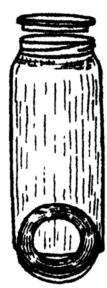


FIG. 2.
Windarts' Perfect. Glass or porcelain top held by metal screw.

FIG. 3.
Spring-top Jar.

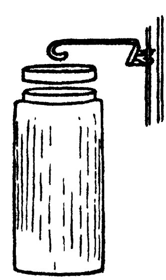


FIG. 4.
"Rex" Automatic Suction Jar.

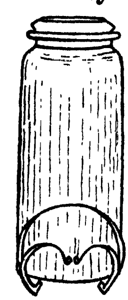


FIG. 5.
"Weeks" Automatic Suction Jar.

and then filled into *sterile* jars while it is still hot, the jars being sealed immediately with rubbers and tops taken directly from scalding water. If the cooking process of the fruit and the sterilization of the jar-tops and rings have been thorough and the closure joint is air tight, the fruit should keep indefinitely. The filling of the jars should be done as quickly as possible, and the jars should be filled to overflowing.

To sterilize jars, put them into a pan of cold water, and to prevent their cracking be careful to rest them on straw, old cloths, or a wooden rest. Heat gradually to boiling point, and boil for ten to fifteen minutes. When the fruit is ready to be filled into the jars lift them out one at a time, care being taken not to touch the inside of the jar and so introduce fresh germs Fill the jars immediately and seal with sterile rubbers and tops.

Method (2).—*Cold pack or sterilization method.*—When this method is used it is not necessary to sterilize the jars. The prepared fruit is filled into clean jars and the syrup is poured over it. The

jars are then screwed partially down, or in the case of the spring-top jar, only one wire is placed in position, or if Rex or Wecks automatic suction jars are used the clamp is placed in position. The bottles are put into the sterilizer and cold water is filled into the container, so that the water just covers the tops of the bottles. The lid of the sterilizer is placed in position and the water gradually brought to the temperature of 90° C. or 190° F. and kept there for about forty minutes. Ten minutes before the end of the process the tops of the screw-top jars or the clamps of the spring-top jars are adjusted. The tops of the Wecks or Rex jars require no further attention.

If it is convenient, allow the bottles to cool down in the sterilizer, otherwise remove them to any place *out of a draught* until they have cooled down. Fruit sterilized below boiling point will not rise in the jars to the same extent as that which is brought to the boil; also it will retain its shape and colour much better than if it is boiled.

Instead of using a sterilizer the filled jars may be cooked in the oven in a pan of water. Care must be taken to rest the jars on straw, strips of wood, or cloths. Cook in a moderate oven until the fruit is done, the time depending upon the nature of the fruit. When done

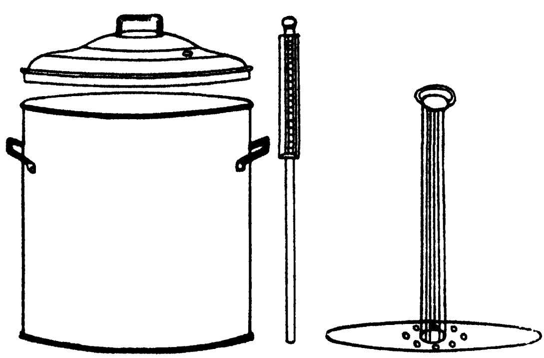


FIG. 6.—"Rex" Sterilizing Apparatus.

remove the jars from the oven and adjust the tops. Fruit sterilized in the oven is apt to shrink, so that jars may be filled up from an extra bottle if desired.

Selection of Jars.—There are several types of jars on the market to-day. Those most universally used are the old-fashioned screw-top Atlas and Mason jars (see fig. 1). These may be used satisfactorily for canning for several seasons, but after having been used a few times the lids are apt to stretch, thus admitting air and causing spoilage of the fruit. Another type is one which has a glass or porcelain top, held in place by a metal screw-top. For the same reason these are not altogether satisfactory (see fig. 2). The spring-top jar is a much more satisfactory one. These are difficult to obtain at present (see fig. 3).

The best jars for canning purposes are the automatic suction bottles, such as are manufactured by the Rex and Wecks companies (see figs. 4 and 5). It may be argued that they are not so satisfactory, because they cannot be refilled when the fruit or vegetable shrinks during the sterilizing, but if the canning is done *below boiling point* there will be very little shrinkage in the case of fruits. In any case

it is unwise to refill bottles containing vegetables as they very easily spoil. When choosing jars for canning always give preference to those with wide mouths, since they are easily filled and cleaned.

Selection of Rubber Rings.—Never use an old ring for canning; it is poor economy. Before using any rubber ring test it by stretching to make sure that it is not perished.

Testing Jars.—If screw-top jars are used it is as well to test each jar before it is filled. Put a little water in each, adjust the rubber, and screw on the top and then invert. If the bottle is air-tight be sure to use the same top for the same bottle.

The Sterilizer.—The sterilizer is simply a closed container in which the food is steamed in a bath of boiling water. It is most important that the lid of the sterilizer should be close-fitting.

(1) There are several sterilizers on the market—both the Rex and Weeks manufacturers sell them at very moderate prices. These are

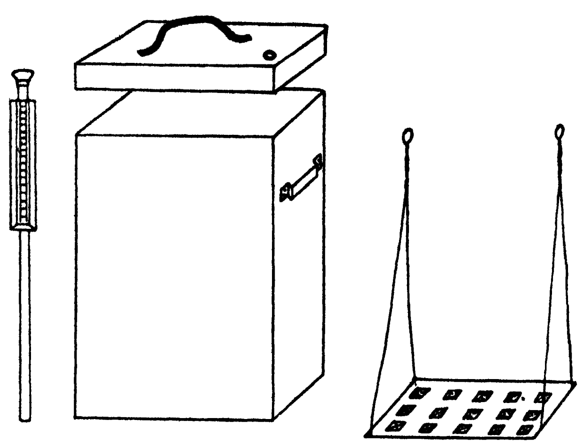


FIG. 7.—Home-made Sterilizing Outfit.

quite satisfactory for home use, any bottles being suitable to use in either (see fig. 6).

(2) A very simple sterilizer may be made from two petrol tins. If the bottles are not too tall the lid may be made the long way of the tin, so that the sterilizer would hold more bottles.

Use one tin for the container. On each side have soldered handles. Make the lid from the unperforated end of another tin, having it fit closely over the opening of the container. Have a small hole made for the thermometer, if one is to be used. Quite satisfactory results may be obtained without the use of a thermometer, but it is advisable to use one. These are quite inexpensive and may be bought separately.

From the opposite end of the petrol tin make a tin rest for the bottles. It is very important that they do not rest on the bottom of the container or they will crack. Make perforations about an inch square in the rest, leaving the flaps to raise the rest from the bottom of the container. Have a wire handle soldered on each side of the rest to facilitate the lifting out of the bottles (see fig. 7).

(3) Any pot which is large enough to hold the required number of bottles and has a close-fitting lid may be used as a sterilizer. A false bottom made of strips of wood, perforated tin, straw, etc., should be placed inside the pot to raise the jars from the bottom.

(4) A fish-boiler will hold quite a number of bottles and is quite satisfactory as a sterilizer, the tin fish rest being used as the bottle rest (see fig. 8).

Preparation of Fruit.—Fruit to be canned may either be preserved whole or cut in halves or quarters. Fruit such as pears, apples, quinces, and peaches are first peeled and then dropped into a bath of salt water to prevent discolouration. If large quantities of fruit are to be peeled the caustic soda method may be used.

Great care should be taken in the handling of the caustic solution on account of its power of inflicting very nasty burns.

Dissolve 1 lb. caustic soda in 2 gallons boiling water. Tie fruit in piece of butter muslin, then immerse in caustic solution for eleven seconds. Remove and leave for one minute, then plunge into fresh cold water. Rub off skins with a piece of coarse cloth, then drop into

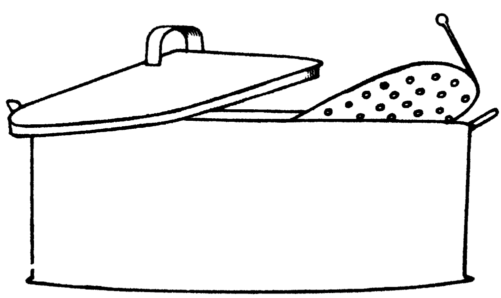


FIG. 8.—Fish Boiler used as sterilizer

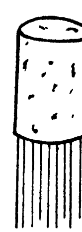


FIG. 9.—Fruit Pricker, made from cork and darning needles.

water made acid with some lemon juice, tartaric acid, or vinegar. For peeling pears the solution should be made stronger.

Some fruits, e.g. plums, apricots, or gooseberries, etc., are not peeled, but, if they are to be preserved whole, should be pricked to prevent the skin from cracking. A useful pricker may be made by sticking some coarse darning needles through a cork (see fig. 9).

SYRUPS FOR CANNING.

For general guidance, syrups may be divided into three classes:—

(1) *Heavy.*—Using equal parts of sugar and water.

(2) *Medium.*—Using one cup of sugar to two of water.

(3) *Light.*—Using one cup of sugar to three of water.

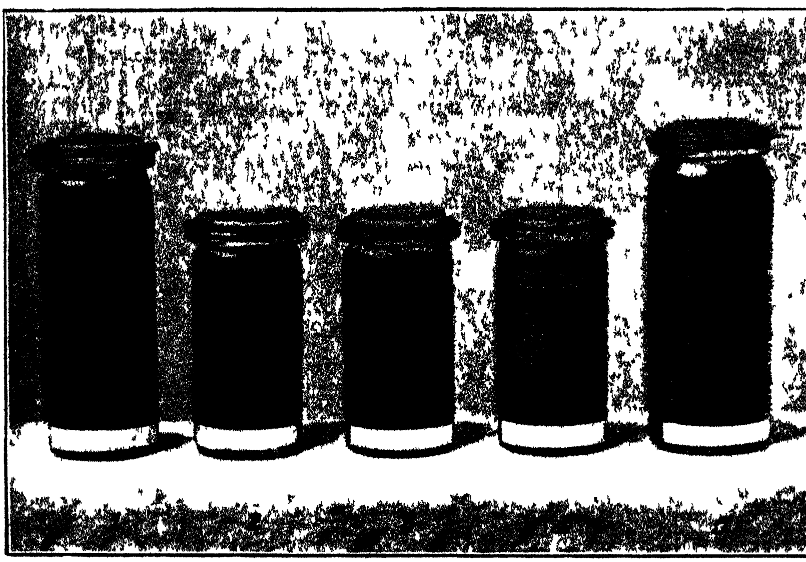
The syrup most generally used is the medium, i.e. one cup of sugar to two of water. As before mentioned, the canning of fruit depends entirely upon its thorough sterilization and the exclusion of air, so that the density of the syrup in no way affects its keeping qualities. Fruit may very satisfactorily be put up in water instead of syrup.

To Prepare the Syrup.—Put the sugar and water in a saucepan and stir over the fire until the sugar is dissolved. After it begins to boil allow about ten minutes for a thin syrup—longer for a thicker syrup. (During the boiling the water evaporates, thus resulting in a thicker syrup.)

To Clarify Syrup.—If it is desired to clarify the syrup proceed as follows:—To every 5 lb. of sugar allow the white and shell of one egg. Whip the egg slightly and mix with the sugar before adding the water. Make syrup as directed above. Before using, strain the syrup through a double thickness of cheese cloth.

N.B.—Unless the best quality of sugar is used no amount of clarifying will make the syrup perfectly clear.

Amount of Syrup Required.—Large fruits, e.g. peaches, pears, quinces, etc., will require about a pint of syrup to a quart jar. The



1 Canned Figs 3 Canned Loganberries 5 Canned Peaches.
2 Canned Pineapple 4 Canned Pears

small fruit will require a little over half a pint to a quart jar. If the medium syrup is used allow to each pound of fruit one-third to one-half its weight in sugar.

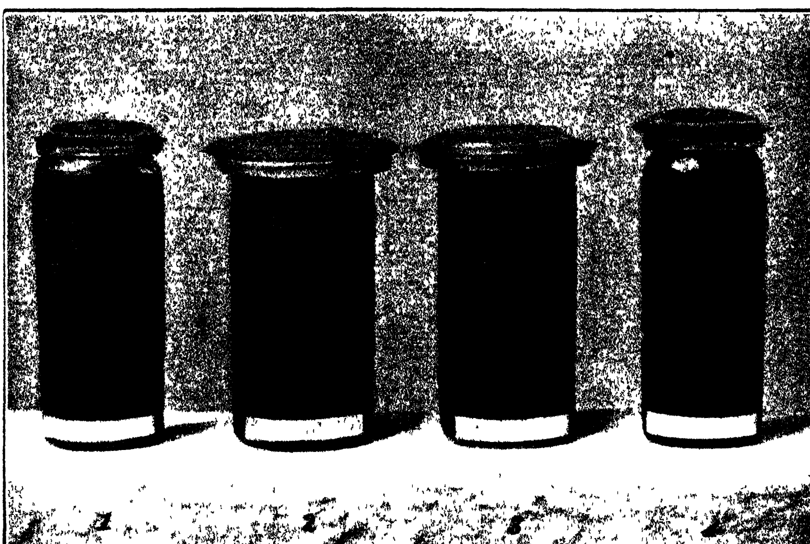
BOTTLING AND STERILIZING.

Packing Fruit into Bottles.—This should be done as closely as it is possible without damaging the fruit, as the fruit is apt to shrink a little in the process of sterilization. Fruits such as plums or apricots, etc., require no further treatment before being packed into the jars. Other fruits, e.g. peaches, quinces, apples, etc., should first be parboiled *in the syrup* before being filled into the jars. The length of time required depends upon the texture of the fruit—from about five minutes for peaches to about fifteen minutes for quinces.

Fill the fruit into the jars. Once again strain the syrup and fill the botles to overflowing with the syrup. If the syrup should run short fill up the bottles with boiling water.

N.B.—If the automatic suction jars are used be careful not to fill the bottles with fruit so that the lid pushes it down. There might be difficulty then in getting the lids to hold, and the bottle would require a second sterilization.

Adjusting the Rubbers and Tops.—After having tested the rubbers and the tops in the case of screw-top bottles, with a clean cloth wipe the rim of the jar. Wash off the rubbers, dry, and place in position. Next place the clean, dry lid in position. Screw down not quite firmly in the case of screw-top jars. Adjust all but one of the wires in the spring-top jar, or clamp down in the case of the automatic jars.



1 Canned Apricots. 2 Canned Pears. 3 Canned Peaches. 4 Canned Plums.

Sterilizing the Fruit.—Place the bottles into the sterilizer, fill to over the tops of the jars with cold water. Heat gradually to 90° C. or 190° F. Keep at that temperature for about forty minutes. Just before the thermometer registers this temperature turn down the flame if an oil stove is being used, or, in the case of a wood or coal stove, place the sterilizer on to a cooler part of the stove.

If the sterilizing is to be done without a thermometer count the time from just before the water begins to simmer. Naturally this is not a very accurate method, but it may prove quite satisfactory.

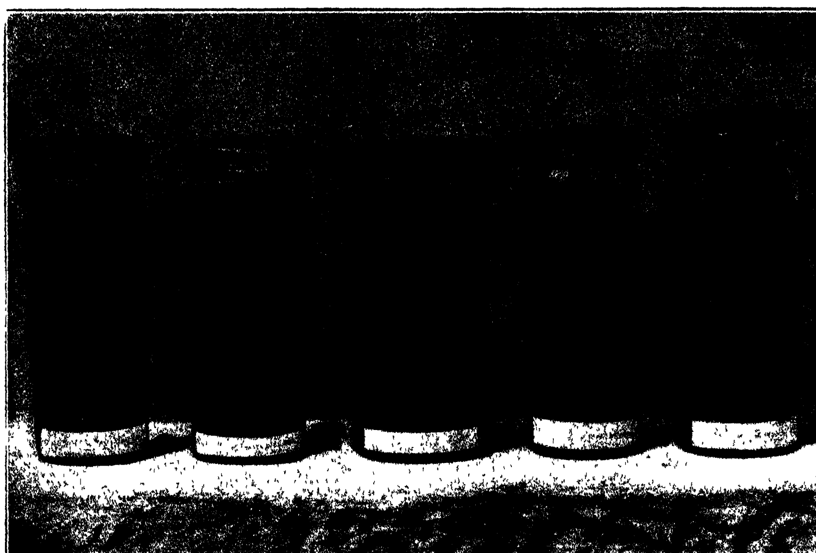
Ten minutes before the end of the sterilization period tighten the lids of the screw-top bottles or adjust the wire in the case of the spring-top jar. The automatic suction jars require no further treatment. Allow the jars to cool off in the water in the sterilizer if convenient. Otherwise put them away out of a draught. (A cold draught will often cause bottles to crack.)

CANNING VEGETABLES.

Vegetables in some respects are more easily canned than fruits. The sterilization period is longer, but there is no trouble about keeping the water in the sterilizer below boiling point, for, in order to kill the bacterial spores which are found in vegetables, it is necessary to boil for a considerable time.

Bacteria live chiefly on foods which contain protein. All vegetables contain a certain amount of protein—some containing a much larger percentage than others, e.g. beans, peas, and mealies.

There are many types and species of bacteria, some of them being beneficial and others injurious to life. They multiply very rapidly, causing changes in the material in which they are growing. Some



1 Canned Mixed Vegetables. 2 Canned String Beans. 3 Canned Mealies. 4 Canned Green Peas. 5 Canned Parsnips.

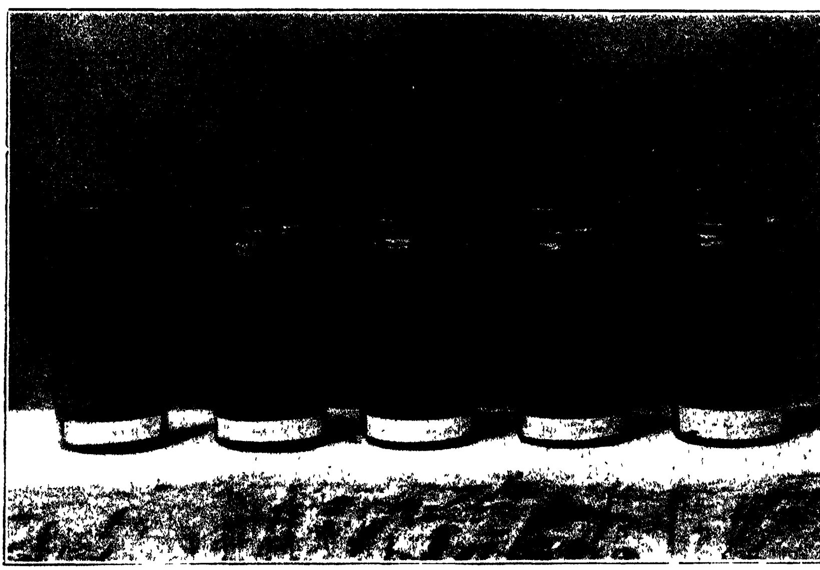
species of bacteria, when the food supply fails them or becomes otherwise unfavourable, go into what is known as spore condition. That is, a very tough membrane forms around a cell. These bacterial spores are very resistant to drying, heat, and disinfectants. Some may be boiled for an hour or two without being killed. It is the presence of such bacterial spores on meat and vegetables such as mealies, peas, beans, etc., which makes it so difficult to can these materials satisfactorily. The spores remain dormant until the conditions around them are satisfactory, e.g. moisture, warmth, and food, when the membrane breaks open and the living cell is ready to grow and multiply.

In order to kill these spore-forming bacteria it is necessary to sterilize the above-named vegetables *on each of three successive days for half an hour on each day.*

Selection of Vegetables for Canning.—Choose only fresh *young* vegetables for canning. Can them as soon as possible after they have been picked.

Preparation of Vegetables.—Wash and prepare as for the table. Parboil in boiling water from five minutes—in the case of peas or cabbage—to fifteen or twenty minutes in the case of beetroot, according to the texture of the fruit. Plunge immediately into cold water and allow to drain. If tomatoes are to be preserved whole, a special canning tomato should be used. The skin is removed by dropping the tomatoes into boiling water and then into cold water.

This blanching and dipping process helps to set the colour and also makes it easier to pack the vegetables into the jars. In the case of green vegetables a pinch of bicarbonate of soda may be added to the boiling water to preserve the colour.



1 Canned Mealies. 2 Canned Turnip. 3 Canned String Beans. 4 Canned Carrots. 5 Canned Cabbage.

Packing Vegetables into Bottles.—As in the case of fruit, pack the vegetables very closely into the jars. Add salt in the proportion of one tablespoonful to a quart jar. Any desired seasonings may be added, e.g. a little sugar with the peas or carrots, or vinegar with the beetroot, etc.

Fill to overflowing with cold water. Adjust rubbers and tops the same as in the canning of fruits.

Sterilizing Vegetables.—Place the bottles in the sterilizer and fill up with cold water the same as when sterilizing fruits. Bring to the boil, and for most vegetables boil for one and a half to two hours. Allow to cool in the sterilizer or out of a draught.

In the case of peas, beans, and mealies, boil for half an hour on each of three successive days. If screw-top or wire-clamp jars are

used tighten the lids just before removing from the boiling water, but loosen them again before placing them in the sterilizer.

Storing Canned Vegetables and Fruits.—An ideal place for storing is a cool, dry, dark place with plenty of air circulation. If placed in a strong light the foods will lose their fresh colour.

How to use Canned Vegetables.—Before using canned vegetables the contents of the jar should be exposed to the air for about an hour so that they may become reoxygenated. The flavour will thus be improved and the vegetables will taste much fresher. Steam the vegetables or heat in any way. It is not necessary to cook canned vegetables before using them. It is advisable to serve any canned vegetable with a cream sauce made of milk thickened with corn flour. The milk will partially supply the deficiency in vitamines brought about by the long period of sterilization.

Students Clipping Ostriches.—Grootfontein School of Agriculture, Middelburg, Cape Province.

Nurseries in Quarantine as at 1st October, 1922.

Name.	Address.	Cause of Quarantine.	Extent of Quarantine.
C. F. Marais	Wellington ...	Red Scale ...	All citrus.
Lovedale Institution...	Alice	Red Scale ...	Lemon stocks.
S. B. Bartlett... ...	Clumber	Red Scale ...	Whole Nursery (citrus).
F. N. Tarr	Bathurst... ...	Red Scale ...	All citrus.
D. A. English & Co. ...	Pietermaritzburg	Red Scale ...	Lemon stocks.
R. Mason & Son ...	Pietermaritzburg	Red Scale ...	Lemon stocks.
T. F. Elphick... ...	Malelane... ...	Red Scale ...	Part Nursery (citrus).
Municipal Nursery ...	Potchefstroom ...	Ross Scale ...	Part Nursery (all privets).

PRINCIPAL AGRICULTURAL ACTS OF THE UNION.

III.

The Laws Governing the Export of South African Produce.

THERE are three Acts, with their relative regulations, that govern the export of South African produce, namely, No. 17, 1914: Fruit Export Act; No. 35, 1917: Agricultural Produce Export Act; and No. 16, 1922: Agricultural Products Grading Act. A brief outline of their principal features follows.

(*a*) THE FRUIT EXPORT ACT, No. 17 OF 1914.

This Act provides for the inspection of fresh fruit which is being exported for the purpose of sale. Under it no fruit may so be exported unless it has been examined and passed by a Government inspector and the containing packages have been branded or stamped accordingly. Any one who intends to become an exporter of fruit must notify the fruit inspector to that effect. Such fruit will be examined in respect of condition and grade (as prescribed by regulation) by the inspector, who will advise the consignor in writing if his fruit cannot be passed. The consignor may then refer the matter to a board of reference (constituted according to regulation), after depositing the prescribed fee therefor; and if the board reverses the inspector's decision, the fee will be refunded.

All fruit rejected (whether the inspector's decision is accepted in the first instance by the consignor or whether such decision is upheld by the board of reference) must be removed, and the consignor is liable for all expenses of storage pending such removal. Moreover, if the fruit is not removed within the prescribed time, the inspector is authorized to have it destroyed or otherwise disposed of.

A consignor may be present at any examination of his fruit by an inspector.

The Act empowers the Governor-General to make regulations regarding the notification of intention to export, packing, time of delivery, marking of packages, condition and grading of fruit, percentage of fruit to be inspected, stamping of receptacles by the inspector, payment of fees for inspection or storage, cold storage temperature prior to export, removal of rejected fruit, the constitution of the board of reference, the grades and species of fruit that shall be shipped, and the order in which shipment shall take place (Act No. 16, 1922), and generally for the better carrying out of the objects and purposes of the Act.

Any one guilty of a contravention is liable to a fine not exceeding twenty-five pounds.

FRUIT EXPORT REGULATIONS.

The regulations under the Act are framed after consultation with the various interests concerned, and with a view to meeting the requirements of the overseas fresh fruit trade. They are subject to amendment from time to time. Those at present in force are Government Notices Nos. 260 of the 6th February, 1920, and 530 of the 29th March, 1922. It is important that every fruit exporter should be thoroughly acquainted with them, for they contain full particulars regarding the grades of fruit and the measurements of their receptacles.

The above-mentioned regulations show the manner in which intending exporters (who must make their own arrangements for the disposal of their fruit oversea) must advise the inspector and become registered, and how their fruit must be consigned. The inspection fee is 1s. 4d. per 40 cubic feet on all boxes going 25 or less to the ton, and 2s. on all boxes going over 25 to the ton.* Pears, peaches, nectarines, apricots, plums, grapes, apples, pineapples, citrus fruit, and mangoes must be packed in new and clean boxes, and the regulations give the measurements thereof. As prescribed in the regulations, every box must be clearly marked on the one end thereof with the registered mark of the exporter, or other means of identification, and other particulars regarding its contents; the other end must also be marked with the shipping mark of the agent, etc.

The fruit must be wrapped in tissue or other suitable paper, and (excepting apples and citrus fruit) may be placed in wood-wool or cork-dust; this, however, does not apply to Almeria grapes. All fruit must be in a sound condition, fully developed, not too unripe, free from disease, bruises, cuts, or other blemishes affecting its appearance, and be of the characteristic shape of its variety and of uniform size in each box.

The regulations state how fruit (other than citrus or pines) not to be shipped in ventilated hold has to be cold-stored for forty-eight hours prior to shipment, and the steps to be taken where private cold stores are used for the purpose: the time spent in refrigerated car may be included in the forty-eight hours. Citrus and pines must be delivered for inspection not less than twenty-eight hours prior to shipment. The exporter must pay the charge for cold storage.

Special attention is directed to section 12 of the regulations, and to Government Notice No. 530, 1922, which amends this section in so far as oranges are concerned. They give the grades of each fruit and its varieties, and advise which varieties are considered suitable or unsuitable for export.

The regulations give the names of the members of the boards of reference at various ports, whose services are available, at a fee of 10s. per consignment, to adjudicate on the decision of an inspector in regard to fruit rejected if so required by the consignor. Seven days are allowed for the removal of fruit finally rejected.

Boxes of fruit may be degraded and re-marked accordingly by an inspector if otherwise complying with the regulations.

Not less than 5 per cent. of the boxes of fruit in any consignment will be opened by the inspector for examination, who will stamp such boxes to that effect.

* A special fee of 5s. per 40 cubic feet is now also levied. See further on.

(b) THE AGRICULTURAL PRODUCE EXPORT ACT, No. 35 OF 1917.

This Act provides for the inspection and grading of agricultural produce which is to be exported by sea from the Union for purposes of sale, the inspection of premises used for the slaughter of animals for such export or for the preparation and manufacture of such produce.

No agricultural produce may be exported unless it has been inspected and branded by an inspector. This does not apply to wool, mohair, or ostrich feathers (fresh fruit is specially dealt with in Act No. 17, 1914), but includes meat or any product thereof, butter (creamery, ungraded farm, and cooking), cheese, eggs, and any article whatever produced or derived by farming operations; also (see Act. No. 16, 1922, section 11) any such article whether or not it has undergone any change of form as a result of some process applied to it since it was produced or derived.

The Governor-General may from time to time proclaim various articles to be agricultural produce for the purposes of the Act and its regulations. This has been done in respect of maize, maize products, oats, bran, rye, beans, peas, lucerne seed, kaffir corn, millet, barley (Proclamation No. 79, 1921), and dried fruit (Proclamation No. 80, 1921).

The produce of any animal which is infected with disease, and agricultural produce unfit for human consumption or unlikely to reach its oversea destination in a marketable state, may not be exported, and the inspector will determine this. An appeal against a decision by an inspector may be made to a board which will be appointed by the Minister, provided the aggrieved person deposits sufficient to cover the costs of the board. This amount will be refunded if the appeal is upheld by the board, whose decision is final.

Produce found on inspection to be unfit for human consumption, and any animal to be slaughtered for meat export and found to be so infected with disease as to render the meat unfit, may be destroyed or so disposed of that it cannot be used for human consumption or animal food.

Any one desiring to have an animal the meat of which is intended for export slaughtered at any abattoir or slaughtering place, must give due notice to the owners thereof, who, before permitting it, must obtain the sanction of the Minister; likewise, he must have the sanction of the Minister to use his own premises if required for that purpose. Abattoirs and slaughtering places used for meat export purposes must be sanctioned by the Minister, whose sanction may be withdrawn at any time where any premises (with the necessary appurtenances and facilities) are not kept in a suitable condition.

The Act empowers the Governor-General to proclaim the specific designation, quality, and standards of composition (including moisture-content), etc., of produce intended for export, and to prohibit the export of agricultural produce which has been so treated as to give it the appearance of an article of different commercial value. He may also make regulations as to the following matters relating to agricultural produce intended for export: The inspection of animals and produce and the premises in which slaughtering or manufacturing,

etc., takes place; the place and manner of inspection; notice of intention to export; packing, marking, weighing, size, etc., of receptacles; delivery of produce at the port; storage, conveyance, and treatment of produce; grading and branding of produce; percentage to be inspected; temperatures; abstraction of samples for analysis, etc.; degrading, regrading, or rebranding; circumstances governing the withdrawal of produce from shipment; the various forms of notices, certificates, etc., to be used; inspection and grading fees; and generally for the better carrying out of the objects and purposes of the Act.

Penalties are also provided for any contravention of the Act, special reference being made to the forging of certificates, brands, labels, etc.

Provision is made whereby any premises may be entered for inspection purposes where agricultural produce is kept, or suspected of being kept, for export, or where any animal is kept the produce whereof is intended for export.

REGULATIONS ISSUED UNDER ACT NO. 35, 1917.

Maize, Kaffir Corn, Maize Meal, and Oats may not be exported from the Union unless they comply with the regulations and restrictions as presently contained in Proclamation No. 159, 1921. This shows the various grades (eight for maize, five kaffir corn, five maize meal, and two each for Cape Western Province and Orange Free State oats), and the description under which the above commodities will be passed for export by the inspector, who examines every bag of grain in a consignment at a fee of ½d. per bag, and issues a certificate to the shipper.

To allow of export, maize must not contain more than 12½ per cent. of moisture, nor be shipped at a higher temperature than 63° Fahrenheit. The moisture-content of maize meal must not be more than 12 per cent., nor must the meal be sour, wet, or caked, or milled from musty, weevily, or otherwise defective grain; further, maize meal grades M3, M4, and M5 must weigh 196 lb. per bag gross.

No certificate will be issued where the grain is found by the inspector to be wet, unripe, weevily, musty, or artificially dried. Maize and kaffir corn must be contained in new "A" quality twill bags 2½ lb. weight (eight porter eight shot), or in new 2½-lb. "B" twill eight by six bags in good condition and double sewn.

Weevily grain, when so marked, may be sent forward for export, the certificate being endorsed "Weevily." Such grain when awaiting shipment will be kept apart from clean grain, nor will it be shipped in the same hold. Grain developing weevil after grading must be removed forthwith by the owner; if it develops before grading, it will be removed to a special store at the expense of the consignee. If a consignor arranges for weevily grain to be shipped in a hold containing clean grain, he is liable to pay the difference between the special export and the ordinary railway rates.

All grain rejected by the grader must be removed within four days, provided that if it is rejected on account of dampness it may be dried at the expense of the consignee and again be offered for inspection. Rejected grain on account of dampness or weevil may be

stored by the consignor, but if it is thereafter disposed of locally by the owner he must pay the difference in the two rates referred to above.

The Government is not responsible for any loss sustained in connection with maize, maize meal, kaffir corn, and oats forwarded for export, and takes no responsibility in respect of any certificate which may be issued by an inspector under these regulations.

Lucerne Seed intended for export will be accepted for inspection at Capetown, or such other place as the Minister may determine. It may not be exported unless sound, well cleaned, and free from dodder. It must not contain more than 2 per cent. of impurities, including other seeds, and must have a germination capacity of at least 95 per cent. It must be contained in the same class of bags as described above for maize and kaffir corn, and the net weight of each bag of lucerne seed must be 200 lb.

Each bag in a consignment is examined (at a charge of 3d., which includes the cost of determination of germination capacity and of purity) by an inspector, who will deliver to the shipper a certificate in respect thereof. All rejections must be removed within four days; such seed may, however, after being cleaned, again be offered for inspection, on condition that the screenings from such cleaning are forwarded at the same time to the inspector for destruction or other disposal.

In the same way as the grain exports referred to above, the Government accepts no responsibility in connection with consignments of seed forwarded or certificates issued.

Butter and Cheese.—At present exportation may take place only through Durban and Capetown. Notice of intention to export must be given on the prescribed form to the Superintendent of Dairying, Pretoria, ten clear days before shipment, although an exception is made in the case of shorter notice if the inspector has sufficient time to carry out the necessary work prior to shipment. Butter and cheese intended for export must be placed in an approved cold storage at the port, the temperature for the cheese to be between 40° and 60° F., and they will be examined at the port in premises approved by the Superintendent of Dairying. There are three grades according to quality, viz., first, second, and third. The regulations show in detail how the grading is applied. The packing must be in boxes, crates (cheese), or cases which, in the opinion of the inspector, are suitable and of sufficient strength. The marking of the packages is an important matter, and must be done in such a manner as to indicate to the inspector the date of manufacture of the contents and, in the case of creamery butter, the number of the churning, and of cheese the number of the vat, as well as the number of cases of butter from each churning and crates or cases of cheese from each vat. Such particulars may be indicated by means of a series of letters or figures placed on the top left-hand corner of the case or crate. Exporters must furnish the Superintendent of Dairying with a key to such letters or figures before the produce submitted for grading will be examined.

Further details of the packing and marking are given in the regulations.

The packages containing creamery butter or cheese which have been examined and passed for export are stamped with a distinctive mark showing the grade, and the inspector issues various certificates

(as prescribed) in respect of same, which give permission to ship and indicate in detail the points awarded.

In the case of ungraded farm butter and cooking butter the cases are not stamped as shown above. Cheese must not be shipped at a higher temperature than 50° F. and butter 30° F., nor will the latter be inspected or graded if its temperature is less than 50° or more than 64° F. Should any butter or cheese be withdrawn or excluded from shipment, the owners or shippers must notify, within ten days, the Superintendent of Dairying, and return to him the certificates issued in respect thereof. The goods, however, must not be moved from the place of examination until the inspector has cancelled the export or grading mark on the boxes. If sent forward later for shipment, the same steps must be taken as in the original instance, and it is in the discretion of the inspector to re-examine and regrade such butter and cheese.

Butter exported from the Union oversea must be sent under the specific designations (*a*) "Creamery Butter" (butter manufactured in a creamery registered under the Dairy Industry Act, No. 16 of 1918); (*b*) "Ungraded Farm Butter" (all butter other than creamery and cooking butter); and (*c*) "Cooking Butter" (all butter which is presented for export clearly marked "Cooking Butter" on two sides of the case or box). No butter is permitted to be exported which contains more than 16 per cent. of moisture or more than 0·5 per cent. of boric acid.

The inspector may take such samples of butter and cheese as he may consider necessary for examination, inspection, or analysis.

The fee for grading or inspection to be paid by the exporter, is 3d. per case or box in respect of all butter submitted for the purpose, and 2d. per crate or case in respect of cheese.

The Government is not responsible for any loss which may be sustained in connection with butter or cheese forwarded for export.

Dried Fruit.—The regulations are drawn up on similar lines to those governing the export of fresh fruit, as referred to above, and the various steps to be taken in respect of export or otherwise are more or less identical. The fee, however, where the board of reference is appealed to is £5 per consignment. Not less than seven days' notice of intention to export must be given to the Government Fruit Inspector at Capetown (the only port at which dried fruit is inspected and shipped at present), and the dried fruit (which includes nuts of various kinds) must be delivered for inspection at least forty-eight hours prior to shipment. The examination fee is 4s. per 40 cubic feet or part thereof. The method of packing, marking of packages, and the grades of the various varieties are detailed in the regulations.

The fruit in each box or tray must be in good condition, of uniform size or colour, and of one variety, and the receptacle must be lined with tissue-packing or some such suitable paper. Only new and clean boxes or bags must be used by exporters.

Special reference is made in the regulations to the standard packing, etc., of stalk or cluster raisins and those known as "dried grapes." They must not contain more than 15 per cent. of moisture.

One per cent. or more of the packages of a total consignment will be opened and examined by the inspector, who will issue to the consignor a certificate of inspection and correct grading, and who will

stamp all boxes or bags complying with the regulations "Passed by Government Inspector."

Meat.—While Act No. 35 of 1917 provides for the regulation of the export by sea of meat, the regulations now in force were issued (Proclamation No. 163, 1915) during the time of the war under the Public Welfare and Moratorium Act of 1914. No meat may be exported by sea from the Union before notice has been given to the Principal Veterinary Officer in the prescribed form, which provides for particulars respecting the port of export, place of slaughter, and marking of the produce. Where an abattoir or slaughtering place is to be used, due notice must be given to the owners thereof, who must hold the sanction of the Minister for the use of their premises for the intended purposes of meat export, and the same sanction must be obtained where a person uses his own premises for similar purposes.

Slaughter for export may take place only on such date as the Principal Veterinary Officer may determine. All animals, the meat of which is intended for export, must be inspected by a Government veterinary officer immediately before slaughter, and may be slaughtered only after his permission is given. Immediately after slaughter each carcass will be examined, and no meat may be exported unless it bears a label on which is endorsed a certificate by a Government veterinary officer or meat inspector to the effect that the meat is free from disease, and stating where and when slaughtering took place. Further, no meat may be received on board a vessel unless it is accompanied by another certificate (as prescribed) respecting the suitability of the meat for human consumption, etc. Nor will the latter certificate be issued unless the following fees for inspection are paid to the inspecting officer:—Cattle, per head, 4d.; for every 12 or fraction of 12 calves, pigs, and sheep, 3d.

(c) THE AGRICULTURAL PRODUCTS GRADING ACT, No. 16 OF 1922.

This Act makes further provision for the inspection and grading of agricultural products and articles prepared, manufactured, or derived from such products. It contains the principle of the levy for the purpose of raising funds for the furtherance of the industry concerned. It provides also, among other things, for the prohibition of the importation of products not conforming to certain standards.

The manufacturer of preparations from agricultural products, or the representatives of producers who have co-operated for the production and sale of their agricultural products, may apply to the Minister to have their particular products inspected and graded. The application will be acceded to if the Minister is satisfied that the aggregate receipts of the inspection and grading fees will be sufficient to defray the expenditure incurred. Special provision is made for the inspection and grading of hides and skins on the payment of a fee, but this may be limited by the Minister to particular abattoirs, slaughter places, etc.

Whenever fees are payable under regulations made under this Act or under the Acts referred to above (Nos. 17, 1914, and 35, 1917) in respect of the inspection or grading of any agricultural product, the Minister may prescribe in addition special fees (known as a levy), to be devoted to the promotion of the future production of the product concerned. These special fees will be paid

into a special account from which the Minister may direct payment to be made, from time to time, to any co-operative or other body of persons who will satisfactorily apply such moneys to the further production and sale of the particular agricultural product for which the account was created; he may also direct the use of the account in any other manner calculated to develop the particular branch of the industry concerned. Those receiving the above moneys must expend it as directed or approved of by the Minister, to whom they are liable to show proof that the moneys have been so expended, failing which, further issues may be discontinued and steps taken to recover any sums not devoted to their proper objects.

The Minister may make regulations prescribing standards of composition and quality for the agricultural product to be inspected and graded; the place and manner of inspection, etc.; the manner of packing and the class of receptacle; the fixing of grades and the place and manner of grading, etc.; the manner of labelling, marking, or branding receptacles; degrading, regrading, or rebranding; the forms of notices, certificates, etc.; the fees or special fees to be paid for inspection, analysis, or grading; and generally for the carrying out of the purposes of the Act. Penalties for contravention may be prescribed; differing regulations may be made in respect of different products.

Any officer of the Department or other authorized person may enter premises on which is kept any agricultural product to be inspected and graded under this Act, and examine any part of such premises or receptacle, etc., found thereon, and take samples of the product.

Penalties are provided in the event of forgery of certificates or brands, etc., under this Act, and the wrongful application of brands, labels, etc.

No agricultural product may be imported into the Union which is not of the same standard of composition or quality of the similar local product which is to be or is being graded under this Act.

"Agricultural product," in this Act, includes fresh fruits of all kinds; any such article as is defined as agricultural produce under Act No. 35 of 1917, and any article produced or derived from such fruits or produce whether or not it has undergone a change of form as the result of some process applied to it.

THE REGULATIONS UNDER ACT NO. 16, 1922.

At the present date the only regulations issued are in respect of the special fee (or levy) on citrus and deciduous fruit and eggs exported; for the former the fee is 5s. per 40 cubic feet, and for eggs it is 9d. per case.

NOTE.—Those desirous of studying the full text of the laws principally concerned should obtain; (*a*) Act No. 17 of 1914 and Government Notices No. 260 of 1920 and No. 530 of 1922; (*b*) Act No. 35 of 1917 and Proclamations No. 163 of 1915, Nos. 79, 80, 132, and 159 of 1921, and No. 531 of 1922; also Government Notices Nos. 1312 and 1313 of 1921 and No. 925 of 1922; (*c*) Act No. 16 of 1922 and Government Notices Nos. 1390 and 1452 of 1922.

FATTENING POULTRY FOR TABLE PURPOSES.

RESULTS OF EXPERIMENTS AT GROOTFONTEIN.

By S. W. NASH, Asst. in Poultry, Grootfontein School of Agriculture, Middelburg, Cape Province.

WHEN requiring a bird for the table, most farmers go into their fowl run, seize the first fowl they are able to catch, kill it at once, have it cooked within an hour, and are generally disappointed in that it is rather thin, and not quite as tender as they expected. But by putting the bird in a coop and feeding it on soft food for two or three weeks a very considerable amount is gained in weight; the flesh becomes much more tender and improved greatly in flavour. The extra cost is only 1d. (one penny) per bird.

A fattening coop can be made out of any old packing case, putting a few slats at the bottom and in front, and a dish for the food, so placed that the birds can reach it easily.

The text books and poultry journals generally advise the use of Sussex ground oats, barley meal, wheat meal and fat. We only used the class of food that every poultry keeper is likely to have on hand, viz., mealie meal, pollard, and separated milk.

The experiment covered eighteen days. All the cockerels used were unsuitable for sale as breeding stock, in fact were the very poorest specimens we could find.

As a rule the daily ration of the birds in our runs is about 2 oz. of bran and pollard mixed with a percentage of meat meal in the morning, green food *ad lib.* at noon, and 1¾ oz. to 2 oz. mixed grain at night—the whole costing about 5d. per bird for the eighteen days.

Each bird used in this experiment received per day, while in the fattening coop, 3½ oz. of common mealie meal and pollard (three parts mealie meal and one part pollard) mixed with enough separated milk to make a thin paste. Charging the meal and pollard at current rates and the milk at 3d. per gallon, the cost of feeding was 6d. per bird for the eighteen days, or only one penny more than spent on those in the runs.

After selecting our cockerels they were carefully weighed and placed in the coop, and starved for twenty-four hours in order to make them hungry; they received their first meal at 6 a.m. on the first day, and their second at 6 p.m.; thereafter they were fed twice daily. They were always ravenous for the food and consumed every scrap. No drinking water was given as there was sufficient moisture in the food, and, of course, we withheld green food.

Two White Leghorns, one each Black and Brown Leghorn, and one White Orpington were marked and put back in the runs and fed with the flock in the ordinary manner as a check against the birds in the fattening coop.

The results are as follows:-

	At Commencement.			At End of 8 Days.			At End of 18 Days.		
	Heaviest.	Lightest	Average.	Heaviest.	Lightest.	Average Gain.	Heaviest.	Lightest.	Average Gain.
	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	oz.	lb. oz.	lb. oz.	lb. oz.
9 White Leghorns ...	4 8	3 4	3 1!	5 2	3 8	10	5 13	3 12	1 2
2 Checks	3 9	3 7	3 8	No cha	nge in	weight	No cha	nge in	weight
4 Brown Leghorns ...	4 3	3 3	3 9¾	4 11	3 5	4	5 1	4 3	1 1¾
1 Check	3 8	—	3 8	No cha	nge in	weight	3 7	Loss 1	—
4 Black Leghorns ...	4 3	3 7	3 15¾	5 2	3 15	12¼	5 12	4 11	1 7¼
1 Check	3 7	---	3 7	3 8	—	1	3 9	—	0 2
5 White Orpingtons ...	4 13	3 8	4 7½	5 14	4 3	14	6 10	4 11	1 14
1 Check	4 8	--	—	4 8½		½	4 10	—	0 2
1 very old Indian Game	4 7	—	—	5 1	-	10	6 0	—	1 9
1 White Wyandotte ...	5 12	—	—	6 11	—	15	7 4	—	1 8

The average gain of the light breeds was 1 lb. 3 oz., and of the heavy breeds 1 lb. 12 oz. The shrinkage in the offal of the cooked birds was remarkable; the gizzards of the game fowl and the largest White Orpington only weighed 2 oz. each, while that of the Black Leghorn used as a check was 4 oz.

There was marked difference in the appearance of the birds when dressed for cooking, and a very considerable difference in the quality of the flesh when eaten, that of the fattened birds being succulent and tender, and the check birds stringy and rather tough.

Conclusions.—For an extra cost of 1d. covering eighteen days and very little extra labour, cockerels of the light breeds, generally regarded as of not much use for table purposes, can be turned into a source of revenue and profit, as approximately one-third was added to the weight of each bird.

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THE SHEEP BLOW-FLY IN SOUTH AFRICA.

II.

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INVESTIGATIONS undertaken in regard to the prevalence and distribution of blow-flies in South Africa have shown that three species at least are concerned in blowing sheep's wool. Nothing definite has hitherto been done with regard to this pest in South Africa, and only a few scattered references to its presence can be found; these indicate that blow-flies have only been noticed as a pest of sheep within the past twenty years. Lately the subject has also been taken up by Mr. J. W. Shoebotham, of the Cooper Technical Bureau at Roodekop in the Transvaal, and he has published some notes in the *Farmer's Weekly*. Practically all that is known of these flies is from the results of investigations carried out in Australia. Briefly, the general habits of these flies are as follows: Normally they breed in carrion, but have developed a habit of depositing their progeny on the wool of sheep, especially round the hindquarters, and where the wool is soiled. The maggots usually work into the skin, sores are formed, and the wool drops off; finally the sheep dies of septic poisoning.

The three species incriminated in South Africa are *Pycnosoma chloropyga*, Wied., *Pycnosoma albiceps*, Wied., and *Lucilia sericata*, Meig.; their relative abundance in the various parts of the Union has not yet been fully ascertained. The two species of *Pycnosoma* are widely spread over Africa and Asia, and the *Lucilia* is a common blow-fly in other countries.

No definite statement can be made as to why these flies should take to blowing the wool of sheep, but there may be something in the assumption that they have a natural tendency to change their pabulum from dead to living meat. Some evidence of this is perhaps given by the fact that one species at least has permanently taken up a parasitic in preference to a saprophytic mode of life. Wool presumably becomes attractive to the flies when soiled with urine, pus, or blood, but the following observation may be interesting in this connection. The two species of *Pycnosoma* have so far only been bred from wool in the coastal region, that is within a hundred miles or so from the coast; but within this region there appear to be two sub-regions, in the one of which, that portion within ten miles of the sea, the flies are hardly active at all in blowing wool. This was well seen in a lot of some six hundred sheep on a coast farm; none of these were infested with maggots, although they had not been crutched, and the wool round the hindquarters was what one might call normally wet with urine. The interesting point is that, as the owner told the writer, if these sheep were taken up to a farm some sixty miles inland, they would become blown very soon. The only

reason that can be advanced to account for this is that further inland, sheep purge much more than near the coast, and this purging makes the wool so attractive to the flies that they blow it at once. The purging, or diarrhoea, would appear to be due to the presence of worms in the sheep, and for some reason sheep are more affected with worms further inland than nearer the coast. There may also, of course, be some possibility that the differences in altitude and distance from the sea have some effect on the bionomics of the flies themselves, but at the same time it should be mentioned that all three species found infesting wool have been bred from meat exposed in East London during the present summer.

Many more data are still required before the distribution and prevalence of the various blow-flies in the Union can be fully known, but as far as the writer's observations go at present, the two species of *Pycnosoma* have proved to be a serious pest in wool only in the coastal regions, while the *Lucilia* has only been bred in large numbers from wool sent from the Orange Free State; that is to say, as a pest it is more prevalent on the higher inland plateau than the other two.

As far as the infestation of sheep in the Border District is concerned, there appear to be two more or less well-defined seasons of abundance for the fly—in October and again about January-February. The flies are, however, not absent in between, and the reason for the apparent periodic abundance at these times may be due to the fact that shearing takes place about November, hence during the hot weather the wool is long in October, and then again towards the end of January. The flies are more troublesome when the wool is long than when it is short.

In connection with the work on the sheep blow-fly, experiments have been carried out to identify the maggots of the various blow-flies, particularly those infesting sheep. Pieces of meat were exposed out of doors, and the resulting maggots isolated and reared. It is interesting to note that so far the flies bred in this way are the same as those reared from wool and from dead sheep, with the addition of *Sarcophaga haemorrhoidalis*, the common grey flesh-fly. The last-named fly has not been bred from sheep, and it seems to have a greater preference to meat, materials such as soiled wool that are attractive to the others not being much to its liking.

The identification of the maggots of flies is rather intricate, as in their grosser structure they are very like each other, generally closely resembling the maggot of the house-fly. More detailed examination of the maggots of various species of flies has revealed certain structures by means of which it is possible to identify them with a considerable degree of accuracy. In general, the form of a maggot (Fig. 1) is broadest at the hind end, tapering towards the head end, the body being divided into apparently twelve segments; there are no legs, and in the type of maggot under discussion there is no clearly differentiated head. The skin is often provided with minute teeth [Fig. 1 (*d*)] in bands or restricted to limited areas on the ventral surface and which aid in progression; some maggots have rows of projecting processes all over the body. At the head end can be seen projecting a pair of black hooks, the great hooks or mandibles [Fig. 1 (*a*)]; these are articulated to a structure within the head end of the body termed the

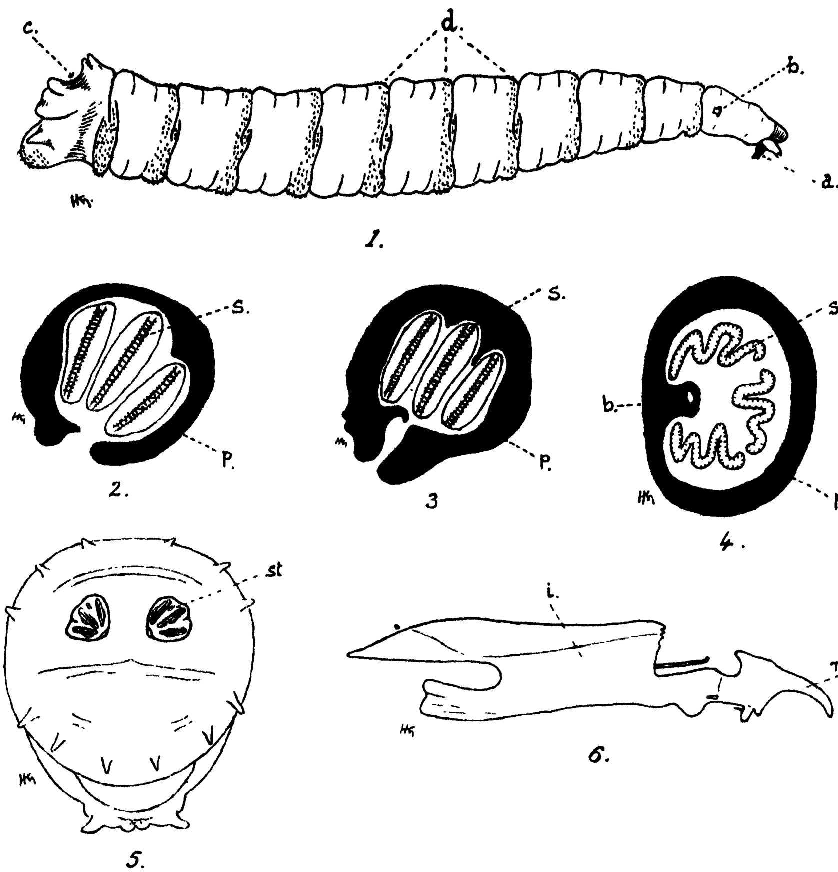


FIG. 1.—*Pycnosoma chloropyga*, Wied. Diagram of maggot or larva. Enlarged. *a*, Mandibles or great hooks. *b*, Anterior spiracles. *c*, Position of area on which posterior stigmata are situated. *d*, Bands of spines.

FIG. 2.—*Pycnosoma chloropyga*, Wied. Diagram of right posterior spiracle of maggot. Much enlarged. *p*, Peritreme. *s*, Slits.

FIG. 3.—*Pycnosoma albiceps*, Wied. Diagram of right posterior spiracle of maggot. Much enlarged. *p*, Peritreme. *s*, Slits.

FIG. 4.- *Musca domestica*, L., the common house-fly. Diagram of right posterior spiracle of maggot. Much enlarged. *p*, Peritreme. *s*, Slits. *b*, "Button."

FIG. 5.—*Lucilia sericata*, Meig. Diagram of posterior aspect of maggot, showing area on which posterior stigmata are situated. Enlarged. *st*, Stigmata.

FIG. 6.—*Pycnosoma chloropyga*, Wied. Diagram of lateral aspect of cephalo-pharyngeal skeleton of maggot. Much enlarged. *m*, Mandible or great hook. *i*, Inner portion to which musculature is attached.

N.B.—It should be noted that this apparatus is double, there being two hooks, etc.

cephalopharyngeal skeleton (Fig. 6). Just below these hooks is the mouth opening. On each side a short distance behind the anterior end is a process, the anterior spiracle or breathing aperture [Fig. 1 (*b*)]; these spiracles have the appearance of "mittens," the "fingers" varying in number from a few to several. On the last segment of the body is an area [Fig. 5 and Fig. 1 (*c*)] surrounded by a number of processes. On this area are the posterior stigmata or spiracles [Fig. 5 (*s*) (*t*)]. This area may be rather sunken, and is sometimes very much so, the upper and lower margins coming together like lips. In the full-grown maggot each of the two stigmata consists of a dark more or less thickened ring, the peritreme [Figs. 2, 3, and 4 (*p*)]. On or just within the peritreme is another structure, the so-called "button" [Fig. 4 (*b*)], the "buttons" on each spiracle being opposite each other; sometimes the peritreme is broken in the region of the "button." Within the peritreme are the slits [Figs. 2, 3, and 4 (*s*)] through which air is taken. These slits are invariably three in number in the full-grown maggot, and in those under discussion are more or less straight and sub-parallel (Figs. 2 and 3), while in the house-fly, for instance, they are sinuous [Fig. 4 (*s*)]. Each slit is crossed by a number of more or less irregular bars which form a grating.

The following are a few notes on the flies that have been bred from wool and from dead sheep during the present summer.

THE LESSER BLUE-BOTTLE BLOW-FLY.

Pycnosoma chloropyga, Wied.

This fly appears to be the one that is primarily responsible for blowing wool in the Border Districts of the Cape Province. It is more prevalent in the early part of summer, when it is found to the extent of about 80 per cent. of the flies bred from wool and from dead sheep. In East London it has been reared from exposed meat, but not to such a large extent.

In appearance it very much resembles the common blue-bottle fly, *Pycnosoma marginale*, Wied., but is smaller, and can readily be distinguished by the markings on the front part of the thorax, these being like two L's back to back over a W, thus: . The flies vary much in size, some individuals bred from underfed maggots being only a third the normal size. *Pycnosoma chloropyga*, Wied., occurs commonly all over the Union, and has been found by the writer indoors during the winter months in Pretoria.

The maggot (Fig. 1), when full grown, is larger than that of the house-fly, and much more robust. It appears white and smooth, but is provided with bands of small spines [Fig. 1 (*d*)]. The posterior stigmata are very prominent, being dark and heavily chitinized. A good idea of a spiracle will be obtained from Fig. 2; the peritreme is dark and fairly broad, with quite a wide opening in the region of the "button"; within the peritreme the slits with their adjacent areas practically fill up the whole of the space. The stigmata of this species closely resemble those of the maggot of *Pycnosoma albiceps*, but as the maggot of the latter is very distinct, there will be no difficulty in distinguishing the two.

Full details of the life-history of this species have not yet been worked out, but in East London, during December, the whole development took place in about ten days. Some attempt has been made to determine the number of eggs laid by each female, but for various reasons the flies in the experiments all died before anything could be done; however, from dissections it would appear that the ova are not fully developed when the female fly first emerges from the puparium, and some days must elapse before she is ready to oviposit. There is therefore quite sufficient time for the flies to be killed by means of poisoned bait; the adult flies must have food, and in the laboratory they took readily to honey soon after they had emerged. In bright sunshiny weather the flies can be seen sucking nectar from flowers in gardens and in the veld. Individual flies live quite a considerable time, and it is even possible that some are able to survive the winter, as the writer has often found them indoors during winter in Pretoria.

THE BANDED BLOW-FLY.

Pycnosoma albiceps, Wied.

This fly is very much the same size and shape as *Pycnosoma chloropyga*, but looks very different. It is a bright shining green, and appears to be banded owing to the presence of narrow, darker, blackish bands at the edges of the segments and across the thorax. It ranges as widely as *P. chloropyga*, but recent observations would indicate it has a different seasonal abundance. In the early part of summer, that is about October and November, *P. albiceps* formed about 10 per cent. of the flies reared from dead sheep, and was not found at all in wool at that time. Later, however, towards the end of January, it was found infesting wool to the extent of about 50 per cent. or more, and in a dead sheep this species preponderated to the extent of 90 per cent. It is interesting to note that in the infested wool the maggots of *P. albiceps* were all quite young, while those of *P. chloropyga* were full grown, which would seem to indicate that the latter is the one primarily responsible for blowing sheep, but it still remains to be proved whether this is always the case.

The maggot of this species can be readily distinguished; it is not smooth and white, but the whole surface of the body is covered with rows of protuberances or papillae, at the ends of which are set tufts of short spines. There are fourteen of these rows, and those on the upper surface are much larger and darker than those on the lower surface. The upper surface, too, is much darker than the lower, the darkening being due both to pigmentation of the skin, and to the presence of a number of dark, rough, raised spots aggregated in patches in the centre of each segment. This maggot has another peculiarity; when it is touched it plays "possum," holding the body rigid in a curved position. The posterior stigmata (Fig. 3) are quite distinctive, although in this case not so necessary for purposes of identification. The area on which they are situated is surrounded by tubercles similar to those on the rest of the body, only here they are much larger, while the tufts of spines on them are smaller. The stigmata are even more heavily chitinized than in the case in the maggot of *P. chloropyga*, the peritreme is very

dark and thick, while the opening at the "button" is closer and longer than in the *chloropyga* maggot. The puparium of this fly, too, can be easily recognized, owing to the tubercles which remain when the maggot pupates. It may not be out of place here to remark that when fly maggots pupate, they do not form a cocoon, nor shed the larval skin, as is the case with butterflies and moths. When ready to pupate, the maggot contracts, becomes barrel-shaped, and rounded at each end. The larval skin, contracted in this way, becomes hard and brown, forming what is termed the puparium, and the true pupa is formed within it. When the adult fly is ready to emerge, a cap on the head end of the puparium is forced off, and the fly draws itself out. When first emerged, the fly is pale-coloured and the wings are crumpled up, but the wings soon grow out to their full size, and in a short while the fly assumes its proper colouration.

THE GREEN-BOTTLE BLOW-FLY.

Lucilia sericata, Meig.

Lucilia sericata, Meig., is a typical "green-bottle" fly, and can easily be distinguished from the two species of *Pycnosoma* by its plain rather darkish shining green colour, and by the fact that it is somewhat bristly. This species also has a much more slender appearance than the other two. Another species of *Lucilia*, *L. argyrocephala*, resembles this species very much, but is more bristly. It is fairly common in the Transvaal, but the writer has not yet observed it in the eastern Cape Province, nor has it been recorded from wool. Another fly that might be mistaken for *Lucilia sericata* is *Pyrellia cyanea*. This fly is very like the *Lucilia* in size and shape, and when alive is also of a plain shining but perhaps somewhat lighter green. When it is dead its thorax becomes a deep shining blue, while the abdomen remains green. This *Pyrellia* has not been recorded as a pest on sheep, and it probably breeds in excreta; it occurs very commonly resting and feeding on ox droppings, and is found all over the Union.

During the present summer (1921-22) *Lucilia sericata* has not been found to any large extent in wool in the coastal region; in fact, not more than one or two per cent. of the flies reared from wool were of this kind. It is, however, common in the town of East London. It has been reared in large numbers from meat exposed experimentally, and it can be seen in numbers in butchers' shops, where it deposits its eggs on the meat exposed for sale. Although not of importance as a sheep pest near the coast, this species is the only one reared from wool received from up-country—the Orange Free State—up to now, neither of the *Pycnosomas* being present. Just what conditions control these pests can only be conjectured at present, but more detailed future observations may throw some interesting light on the subject.

The maggot of this species is somewhat similar to that of *Pycnosoma chloropyga*, but is not so robust. An examination of the posterior stigmata (Fig. 4) will quickly enable one to distinguish it. The stigmata are not so heavily chitinized and darkened, and are therefore not so conspicuous; the peritreme is quite narrow, and

its margin is entire; the "button" is situated on the peritreme, and has a small rounded opening in its centre. The three straight slits are very similar to those in the other two species, but are rather narrower.

The eggs are laid in batches from half a dozen to fifty and more, and the young maggots hatch in twenty-four hours, becoming full grown in five days. An interesting habit of these maggots has been observed in the breeding jars. When full-grown they do not burrow down into the soil, but congregate on the soil just underneath the piece of meat in which they have been feeding. They become pinkish in colour, and remain passive in the fully extended larval condition for two or three days, when they contract, and then pupate. Adult flies emerge in four or five days. The foregoing details refer, of course, to conditions in midsummer; cooler weather lengthens the life-history.

THE GREY FLESH-FLY.

Sarcophaga haemorrhoidalis, Fall.

Although this fly has not been found to blow wool, it is mentioned here, as it is one of the flies that most commonly blow meat. It is common everywhere, but appears to be much more frequent in towns than in the country. It proved itself a great nuisance in experimental work, as its maggots were sure to become present in every piece of meat exposed unless special precautions were taken to prevent them gaining access to it. The young maggots, which are extruded alive by the parent fly, can travel quite a good distance in order to reach their food, so that even when one cage was placed within another they were not always kept out. However, the full-grown maggot is easily recognized once it is known. It is large, robust, and somewhat flattened dorso-ventrally; a conspicuous feature is that the area on which the posterior stigmata are situated is deeply sunken, its upper and lower borders forming very distinct lips, which, when the maggot is still alive, are continually closing and then opening suddenly. The stigmata are in the upper part of the area, and perhaps in co-relation with the extra protection afforded by being in a cavity they are very slightly chitinized. The peritreme is very slight and has a very wide opening; the slits, too, are slight and narrow.

The adult fly will easily be recognized as the common large grey fly, which has a distinct chequered pattern on the abdomen.

MATERIAL FOR STUDY.

During the course of this paper reference has been made to the fact that much still remains to be done before it can be said that everything is known about the sheep blow-fly in this country. So far three species have been found troublesome in sheep, but it is quite possible there may be others. There are questions relating to the abundance and distribution of those that are known; also to their seasonal distribution and the effects of drought and of wet seasons on the numbers of the flies. Parasites may be present, and perhaps one only needs to be discovered and encouraged for it to become an efficient help in combating the blow-fly pest.

It is on these lines that farmers and others interested in sheep will be able to give much valuable assistance. Not only are observations on the presence of the fly needed, but also on its absence, as it would seem that some parts are much more troubled than others.

The more material there is available, the better will it be for investigation work. Farmers are therefore asked to send as much as they can, not only from various parts of the Union, but also at different times throughout the year. Wool infested with maggots is particularly required. Pieces of infested wool should be clipped from the sheep and packed at once in a small box, wrapped tightly round with paper. The parcels should be marked "Sheep Blow-fly Specimens," and may be sent O.H.M.S. addressed to the Border Entomologist, P.O. Box 16, East London.

Information on the following points is wanted from farmers, especially when sending specimens:—

From what part of the sheep were the maggots taken?

Was the animal recently infested or had it been suffering for some time?

To what extent were the sheep infested? Were only a few odd sheep affected, or was the infestation general throughout the flock?

Was the present season normal as regards rainfall, or had there been a drought or more rain than usual?

Had rain fallen shortly before the maggots were found on the sheep?

Do the sheep suffer to any extent from intestinal worms, and how much diarrhoea or purging is there?

Are the sheep infested more at one time of the year than another, and, if so, when? Are maggots noticed in the wool during the winter months at all?

In conclusion the writer would like to express his thanks to Mr. G. W. Turpin, of Woodridge, Dohne, for his kindness in affording him opportunities of studying the subject, both at Woodridge and on his farm Silverdale, in the East London District.

Outbreaks of Animal Diseases: September, 1922.

Disease.	Transvaal.	Natal.	Cape.	Orange Free State.	Transkei.	Totals for September, 1922.	Totals for Calendar Year. 1921.
East Coast Fever	—	1	—	—	2	3	212
Mange	24	3	16	1	8	52	272
Anthrax	41	7	16	21	20	105	1,557
Dourine	—	—	4	—	—	4	50
Glanders	—	—	—	—	—	—	8
Tuberculosis	—	—	—	—	—	—	10
Epizootic Lymphangitis	—	—	—	—	—	—	6

AGRICULTURAL EXPERIMENT.

By E. Parish, B.Sc., Vice-Principal, School of Agriculture, Glen.

Farmers are not ordinarily much concerned with the technique of agricultural experiment—the results only affect them. Mainly for this reason a recently prepared scientific bulletin, entitled "Agricultural Experiment, its Design and Interpretation," is not being published in the *Journal*, but is being printed as a separate bulletin. It is well, however, that farmers should realize the difficulties attendant on agricultural experiment, of the care necessary in the design and execution of it, and in interpretating the results obtained.

On the face of it it appears a simple thing to test the effect of the application of fertilizer to a crop. Enormous variation from the normal or true result, however, ordinarily occurs in the figures obtained from the plots under test and unless the officer in charge of the experiment is aware of the extent of this probable variation, he is very liable to be misled. Most farmers during their life-time get yields from crops either lower or higher than their expectation, and for which they are unable to account, but few are aware how frequent this variation from the normal is, or how large it may be. In field trials in adjoining plots treated similarly in all respects the yield of one may be twice that of the other, and for no reason that can be discovered.

For example, in eight one-acre plots of wheat arranged on the following plan at an experimental station in South Africa, with all plots treated alike in every respect the yield in lb. of combined grain and straw was as follows:—

1124	1178
1051	1224
935	981
400	767

Similarly with experiments with animals, the individual variation is so great as to necessitate repeated trials with comparatively large numbers of animals before any reliable conclusion can be drawn. Often under identical conditions, as far as such is humanly possible, one animal will give twice the gain in live weight of its

neighbour, and it is impossible to ascribe the difference to any cause than individual variation.

For example, in fattening experiments conducted in South Africa with a group of four old oxen selected as nearly alike as possible, one animal made three and a half times the gain of another, and in another experiment conducted on similar lines one animal made eleven times as much gain in weight per day as another.

These are exceptional cases, but they show the extreme variation possible, and indicate how careful it is necessary to be, in drawing nice conclusions from the results of single animal or single plot experiments.

FIELD TRIALS.

Causes of Variation.

The variation in the yields of plots similarly treated is due partly to difference in soil and partly to the influence of numerous small factors, such as uneven seeding and manuring and cultivation, errors in weighing, effect of birds, insects, previous crops, etc., the effect of which can never be accurately gauged beforehand.

Figures obtained from Rothamsted illustrate the two kinds of variation very well. At that station the yields of hay from two plots of grass in the same field have been recorded every year since 1856. The measurements and weights were recorded by skilled and experienced officers, and the experiment has throughout been conducted as thoroughly as could possibly be. Taking the figures for the whole period of fifty years, the one plot is found to average 10 per cent. higher than the other, a result no doubt largely due to difference in soil. In individual years, however, the plot which averaged 10 per cent. greater, was 49 per cent. greater and 10 per cent. less than that of the other, this random variation being due to various factors.

Even in five-year periods absolutely reliable results cannot be obtained, and the above experiments furnish striking evidence of this. As stated, one plot over the whole period averaged 10 per cent. greater than the other. In five-year periods, however, the one plot averaged 28 per cent. greater and 4 per cent. less than the other, showing that a difference in yield between the two plots gained over an average of five years could not be considered absolutely reliable.

Farmers generally hold the belief that for reliable results to be obtained the plots ought to be large. Experiment, however, shows that the difference in yield of a crop due to difference in soil is greater in large plots than in small, and that the only way to nullify the effect of the variation in soil is to repeat the plots several times in a systematic way.

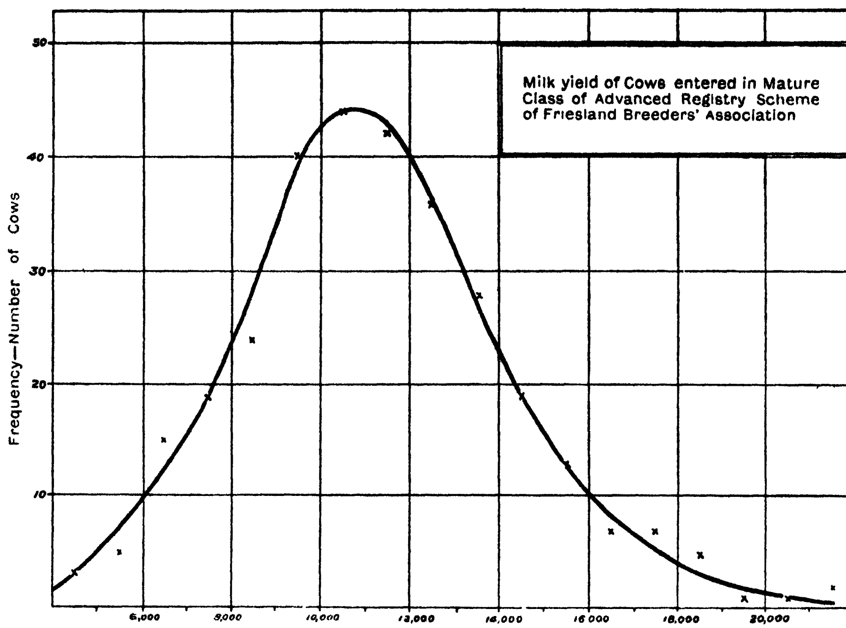
If it be desired in field experiment to reduce the error to a small figure in the region of, say, 2 per cent., it is necessary to replicate the plots five times. Thus, if one factor were under test, e.g. the effect of fertilizing with a definite quantity of superphosphate, five plots fertilized would need to be interspersed systematically with five plots unmanured; and a convenient and suitable size for each plot would be from one-fortieth to one-tenth of an acre.

AVERAGES.

The opinion generally held is that an average is a reliable figure, giving a true representation of the range of results under consideration. There are many limitations, however, to the use of an average.

It can only give a true representation of the series when the variation is mathematically normal and not disturbed by any factor.

An example may illustrate the point more clearly. If a curve of the milk yield of cows obtained in the mature class of the advanced registry scheme of the Friesland Breeders' Association of South Africa up to 1920 is plotted, it is found that the greatest number of cows in this class during 300 days give between 10,000 pounds and 12,000 pounds, with a mean yield of 11,340 pounds for the class. In this case, the results being normal, as seen from the curve, the average figure is of value.



Taking another group of figures, however, viz., the yields per morgen of maize in the Union, it is seen how little information an average can really provide. According to the census of agricultural production for 1918, the average yield of maize in the three Provinces of Transvaal, Orange Free State, and Natal is 4.6 muids per morgen. If the districts be grouped according to yield, it is seen that the greatest number of districts, however, produce between 3.6 and 4 bags per morgen, while there are also more districts producing between 5.1 and 5.6 bags than there are producing 4.6, and the range of yield is from 1.82 to 11.67 bags per morgen.

In this case the variation of the series is not normal, there being several disturbing factors, such as irrigation, rainfall, method of farming, etc., and a bare statement of the average cannot adequately represent the range of yield or show the yield obtained in the greatest number of districts.

Even at the risk of labouring this point on the limitations of an average, the following extract from an article on the "Cost of a

Bushel of Wheat," by F. W. Peck, of the Office of Farm Management and Economics of the United States Department of Agriculture, may be quoted:—

"WHAT ABOUT THE AVERAGE.

"It is quite possible, of course, to figure out the average cost of a bushel of wheat for a given region—or for the whole country, or even the world for that matter—provided the necessary data on cost of seed and labour, use of land, etc., are available, but after such an average is found it is a sort of statistical white elephant. The average does not serve the purpose it is popularly supposed to serve in establishing the right relation between costs and prices.

"The average person—that elusive individual whom no one has ever met, because, like the average cost of wheat, he is a mere abstraction—may be evoked at this juncture to ask the natural question: 'Why will it not do to use average as the measure of the cost of producing wheat?'

"WHY THE AVERAGE MAY BE MISLEADING.

"The answer to this question may be framed with an eye to the fact that the public mind is prejudiced in favour of the average as a statistical yard-stick, since it has been so largely used as such. If the average cost were set up as a standard, we would have merely a 50 per cent. standard, since the average tends to divide the figures into two groups of about equal size, so that about half the farms concerned show up as producing wheat at a cost above the average and half at a cost below the average. On this basis, if the average cost should determine the price, about half the farmers would be producing at a loss. When the price of a commodity goes so low that production is a fifty-fifty gamble, the tendency for many of the producers is to quit and go on raising some other crop that promises a better chance of profit. The results may be under-production and a period of higher prices."

Fortunately it is possible to obtain by the use of certain formulae, figures which do convey an idea of the range of any series and of the reliability of the average. These formulae are $0.67\sqrt{\frac{\Sigma d^2}{n-1}}$ for the probable error and $\sqrt{\frac{\Sigma d^2}{n-1}}$ for the standard deviation. From these figures it is also possible to calculate by means of the formula $\sqrt{E_1^2 + E_2^2}$ the probable error or the reliability of the difference of two probable errors; and it is possible to ascertain the measure of certainty which may be attached to any group of results. Without the use of these figures, the interpretation of any set of results of agricultural experiment may be erroneous and misleading.

VARIETY TRIALS.

In these trials it is often necessary, owing to shortage of seed or other circumstance, to plant a limited number of rows only. In this case, the effect of the lack of competition on the outside rows must be guarded against. As an example, in six plots of maize, each of four rows, at this institution recently, the average weight of grain and straw obtained from the two inside rows was 98 lb. per plot,

and the corresponding average of the two outside rows was 156 lb., an increase of 59 per cent. on the average of the two inside rows, the lack of competition on the outside rows having a much greater relative effect in the dry season, in which the experiment was conducted than if plenty of water had been available.

CO-OPERATIVE EXPERIMENT.

In co-operative experiments the difficulty of harvesting carefully areas of from one-tenth acre to one acre or more frequently arises. Experiment has shown that by harvesting carefully a number of accurately measured areas distributed systematically about the plot, a result may be obtained which gives as accurate a figure as harvesting the whole area.

LIVE STOCK EXPERIMENTS.

In feeding experiments with fattening or growing animals, the individual variation is so great that the results obtained from groups of less than ten animals are of very little value, and certainly need to be accepted with caution. Great care in the selection of animals in respect of breed, sex, type, and age is also necessary.

With feeding experiments for milk production even greater difficulty is met with. The milk yield is affected by the weather, by slight indisposition, by oestrum, by pregnancy, by the time of calving, by change of attendant, and varies with the stage of lactation. Even with the alternation system, in which the groups under the different treatment are interchanged after definite intervals, it is very difficult to obtain reliable results, owing to the disturbing effect of the change, and the progressive variation in milk production as the lactation advances.

ERROR DUE TO BIAS IN THE OBSERVER.

Knowing the variation liable to occur in the results of single-plot trials, a survey of agricultural experiments so far conducted in South Africa leads one inevitably to the conclusion that the observers in some cases were biased in favour of the result they desired to obtain. However fair-minded the observer may be, there is always a danger of involuntary bias. An instructive example of the possibility of error of this type is afforded by plotting the frequency curves of the results recorded in the United States Department of Agriculture Year Book for 1918 of 169 observations of the depth of spring and fall ploughing in Indiana. These curves show maxima at 5, 6, 7, and 8 inches, and minima at the half inches. It is extremely improbable that such a curve accurately represents the actual depth of ploughing; it does, however, represent the *recorded* depth of ploughing. In this case the error is not in the results, but in the observers, and is due to a tendency in the majority of them to observe and record the depths in units of inches rather than in halves.

It is obvious from the above remarks that a great deal of care and a fair amount of experience and knowledge are required for the proper conduct of agricultural experiment, whether with field crops or with animals, and although farmers can learn much from experimenting on their own, yet they should not regard the results obtained from single-plot trials as being final and decisive, unless the difference due to the factor under test is very large indeed.

S.A. DRIED GRAPES FOR THE UNITED STATES.

Organization of the Trade.

MR. LAMONT, Principal of the Elsenburg School of Agriculture, who is at present touring the United States studying the various problems of Agricultural Economics, has furnished a brief report on the possibilities of that country as a market for our dried grapes. He says that our dried grapes are used very largely, if not almost entirely, by Italians in New York city and Chicago, and also in Pennsylvania, for wine making. These people will make wine from white grapes only when there are no red grapes or raisins on the market, or if the latter are sold at prohibitive prices. The white raisins, such as Steen, are considered equal to the Turkish and Smyrna dried grapes and such California raisins as are cheap enough. The Turkish article is now (September) quoted in New York for forward delivery at 8 cents per 1 lb. duty paid New York, which means less than 4 cents per 1 lb. at port of shipment, so the grower does not get very much after deducting packing and handling costs. Our Hermitage raisin has made a good name for itself, and is in keen demand. But there is no use (at present at any rate), in shipping any white grape raisins. Just recently a broker was offered 7 cents per 1 lb. for a few thousand boxes of Hanepoot raisins, which he refused.

The trade here consists of (1) our grapes, (2) California fresh grapes, beginning September and going on to November; (3) Eastern and some Spanish and Californian dried grapes which come in between our season and the Californian. The summer months, July, August, and September, are unfavourable for this commodity. To get a good market our dried grapes must arrive during April, May, and June, with July as the last month. This may alter later on, but is the position at present. Our shipments undoubtedly suffered this year by their late arrival, and some white dried grapes will either have to be sacrificed or converted into wine or grape juice in New York.

Inquiries revealed the fact that 200,000 boxes of 25 lb. each (2500 tons) of the dried product could be absorbed. Although we are not likely to have that quantity available, it shows that there is a pretty good opening for as much Hermitage as we can ship from South Africa. The trade is quite satisfied with the size of our pack (25 lb. boxes) and the way in which the raisins are sent (two boxes strapped together). There is, however, strong objection to Steen grapes being mixed with the Hermitage, and red grapes have been included in some boxes marked "Hermitage," which depreciates values and leads to dissatisfaction on the part of the buyers. Nothing but what is called "Black Hermitage" is wanted. Boxes of Steen grapes were actually marked "Hermitage," and there was no question that the

marks were South African ones. Other boxes from South Africa with "Steen" on the printed labels, had "Hermitage" stencilled over the word "Steen." The actual contents were Hermitage with a little Steen and some red grapes. This makes a bad impression and destroys confidence in our product, which is both undesirable and unnecessary. Besides, where the competition is so keen, things like these only tend to reduce prices.

As to packing, mention must be made of the variety of shippers' marks. Some agents' notes of shipments of a few thousand boxes and some of the individual consignments were as follows, all included in the one lot:—4, 24, 28, 36, 32, 160, 26 and 4. These came from various growers, and certainly entailed the additional expenses connected with the handling of such small lots. The suggestion has been put forward that we should ship under one brand only. If we had different grades we might have more brands, but there is no necessity for that as our grading need be for condition and colour only. Size of grapes does not enter into the matter. This suggestion is sound. If the dried grape business could be conducted co-operatively there should be no difficulty in fixing an attractive label or brand and constituting an organization for shipment ensuring uniformity in the exported product. This would be a legitimate and essential part of the proper distribution of South African grapes. The best methods of utilizing and marketing the produce of our vineyards have to be studied, and we are likely to have better correlation if all the various outlets were concentrated under one organization. The Government grading is, of course, of no value to the receiving trade, as the condition on arrival is what counts: it is a protection against shippers sending bad stuff from Capetown.

The price is difficult to estimate, but most are agreed that we could depend on getting about 13 cents in New York duty paid. This would be equivalent to about 9 cents f.o.b. Capetown, or, if the duty is increased under the new tariff, a little less, approximately 4d. per 1 lb. in boxes. One cannot definitely say of course what next year's market will be; but the above is indicated.

Probably as important a point as any is the selling organization oversea. It is useless to have half a dozen brokers and selling agents all working at the same time to dispose of our grapes. Such a procedure can have no other than a depressing effect on prices. The article must have one or two, preferably one, distributing agencies to handle the whole output. In other words, apply the same principle adopted in the motor business in South Africa, and have our accredited agent or agents. If there are more than one they must be kept completely advised of shipments en route to avoid dumping on the market; a very large number of boxes would also probably be sold while the raisins were still afloat.

The *Journal* aims at keeping farmers informed of what the Department of Agriculture is doing, also of such matters affecting their interests as come under its purview. The *Journal* contains original articles for the guidance of the farmer on the many and diverse problems which face him. Every farmer should read it and keep it.

THE VALUE OF FINENESS AND LENGTH IN WOOL.

By P. D. ROSE.

(*Note.*—Mr. Rose first took the diploma course and then the special sheep and wool course at the Grootfontein School of Agriculture. After acting as an assistant lecturer at that Institution for a considerable period, he secured a Government bursary for study at the Technical College, Bradford. He has now completed his course, and having secured an extension to his bursary, is visiting the principal factories, markets, etc., in England prior to his return. —EDITOR.)

CAPE wools in the past have not enjoyed a very good name in the Bradford trade, but the very rapid improvement that has taken place within the last few years is gradually making itself felt, and Bradford topmakers and spinners are appreciating our wools more to-day than ever before.

The Union, generally speaking, can be considered an essentially fine wool-producing country, and in view of the greatly diminishing quantities of fine wools from other countries it would be to our advantage seriously to consider the continued production of fine wools of high quality. It is to this end that a few remarks on the value of fineness and length in wool are made.

The physical properties of a fibre always determine its usefulness for the manufacture of particular fabrics, and the most important of these properties are surface structure, fineness, length, tensile strength, elasticity, pliability, colour, and conductivity for heat. The two properties, however, that concern the producer most are fineness and length, and the value of each in turn will be considered from the point of view of usefulness in manufacture.

The peculiar internal and external structure of the wool fibre, in combination with the above-mentioned properties which it possesses to a marked degree, leave it almost without a rival as a textile fibre. Wool possessing both properties of fineness and length enables the manufacturer to use it for a variety of purposes, whereas the lack of either greatly limits its usefulness. Taking fineness as the first property, it will be of advantage to consider exactly what bearing fineness has on a few of the other more important properties, and what part these properties in their turn play in the actual spinning value of the fibre.

Fine wools are, as a general rule, shorter than coarse wools, possess more waves, and a correspondingly greater number of serrations or cuticle scales to the linear inch. This rule for all practical purposes can be considered as definite, though exceptions do occur as is the case in wools taken from different breeds of sheep.

Variations in fineness of fibre occur not only in different breeds of sheep, but in different animals of the same breed, in various portions of the same fleece, in successive clippings from an individual

sheep, and in the individual fibre itself. In all cases increased fineness is generally accompanied by an increase in the number of serrations to the linear inch. The crimpy structure, which is also of great value in a fibre, is also affected by fineness, the number of crimps being increased as the fibre decreases in diameter.

The serrations forming the saw-like surface vary not only in number as the diameter is either increased or decreased, but in their method of attachment to the shaft of the fibre, being more prominent or detached for a greater portion of their length in the case of fine wools.

Wool, when spun, is largely dependent on these scales for the power which one fibre possesses of interlocking with or clinging to another, thereby enabling a continuous ribbon or sliver to be maintained throughout the various drawing processes, and this clinging power is greatly assisted by the reversed relationship in which the fibres are arranged in the preparatory processes. The entire absence of these scales would render the spinning of short wool, at least, almost impossible if not entirely so.

In yarn construction it is, of course, necessary, in order to allow one fibre to grip or engage with another, for overlapping of fibres to take place, and it will, therefore, be easily understood that the more numerous and prominent these scales, the more readily and surely will the fibres grip, consequently less overlapping will be necessary. Reduced overlapping surfaces, in combination with the fact that there are necessarily many more fibres to the given pound in the case of fine wools, length being equal, enables the spinner to produce a longer yarn of smaller diameter.

Fineness also has a direct bearing on the strength of the fibre, fine wools invariably having the greater tensile strength in proportion to their diameter. Fineness is, therefore, for many reasons a very desirable quality, and as it is generally accompanied by such other most desirable properties as softness, elasticity, pliability, and fullness of handle, its value can hardly be over estimtaed.

Length, too, plays a most important part, but it is so intimately associated with fineness in the actual spinning value of the fibre, that some of the observations regarding the value of fineness may with advantage be applied to length. Length is the factor that not only decides the method of treatment, but the ultimate uses to which the wool is put. Its presence enables the topmaker to give each individual fibre better treatment, and best to arrange the fibres in that parallel condition so essential in the construction of a level worsted yarn. Increased length also enables the spinner to keep the fibres under better control, and fibre control is probably the most important factor in spinning.

Increased length with the same degree of fineness, would, it the same argument as in the case of fineness be applied, mean considerably less overlapping, and as each overlap necessarily means a reduction in the ultimate length of the thread. the value of length in the spinning to higher counts is obvious.

The fewer the overlaps the more level can the yarn be spun, with still fewer fibres to the cross section, and the extra length of fibre enables the spinner to insert more twist, which results in a yarn of greater tensile strength and more durable wearing qualities.

From the above it is hoped that some idea of the inestimable value of these two properties may be obtained, and that growers will endeavour as far as possible to combine fineness with length and not sacrifice fineness for a little bit of extra length, as seems to be the tendency to-day.

A good super 64's to a 70's quality of 3½″ to 4″ long can be grown very successfully on commercial lines, and this is all that the Bradford trade requires. Any one attending the Coleman Street Wool Sales, the world's biggest wool market, will see emphasized every day the great difference in price that is paid for wools of this description and for those lacking either one or both these properties.

NOTE by MR. E. N. S. WARREN, Senior Lecturer in Sheep and Wool, Grootfontein School of Agriculture.

From the foregoing it is hoped that it will be clear that the fine wool referred to is true merino wool, and must not be confused in any way with a comparison between merino and crossbred or comeback, as it is so called. A farmer comparing a merino wool of 70's to 80's quality with a 64's quality would call the former a fine wool, and the latter, by comparison, a strong wool, but the 64's is as much a true merino or product of a fine wool breed of sheep as is the 70's to 80's quality, and as such is—as mentioned by Mr. Rose—greatly desired by the trade. Sixty-four's to 70's is a class of wool that can be produced profitably in most parts of South Africa, whereas comparatively few parts of the country are absolutely suitable for the really profitable production of a high class 70's to 80's quality wool.

CITRUS CANKER ERADICATION.

INSPECTION WORK, SEPTEMBER, 1922.

Farms Inspected—

Rustenburg District (*Hex River Ward*).—Buffelspoort No. 668, Buffelshoek No. 900, Buffelsfontein No. 558, Bokfontein No. 647, Boschfontein No. No. 381, Boschfontein No. 193, Grootfontein No. 606, Modderfontein No. 247, Rietfontein No. 431, Rustenburg, Spruitfontein No. 349, Waterval No. 544.

Pretoria District (*Crocodile River Ward*).—De Kroon No. 420, Greylingspost No. 111, Krokodil Drift No. 327, Haartebeesthoek No. 524, Moselekatznek No. 579, Pretoria North, Roodekopje No. 132, Vissershoek No. 45, Wildebeesthoek No. 20.

Waterberg District (*Nylstroom Ward*).—Roodepoort No. 2148.

Fresh Infection.—Nil.

Fresh Outbreaks.—Nil.

Total Number Inspected—

Nursery trees, 27,141; trees other than nursery, 14,960; trees found infected, nil.

Number of inspectors engaged, 21.

INQUIRIES AND REPLIES.

SELECTED LETTERS FROM FARMERS.

[Hereunder are a number of recent letters replied to by the various Divisions and Schools of Agriculture concerned. They are selected for publication as being of interest to farmers generally in the localities affected. In each case the area only from which the inquiry emanates is given; as the replies must necessarily be curtailed, they will indicate, when required, literature from which further information may be had. All departmental bulletins quoted are obtainable on application to the Editor.]

Yellow Maize.

Pietermaritzburg.—Regarding grain for cattle (and also for ensilage and mealie hay), what variety of yellow mealies will be best?

Cedara School of Agriculture replies:—The following yellow varieties are widely grown in Natal, and from which a choice may be made:—*Yellow Horsetooth*: Very late yellow dent, producing heavy growth of foliage, with large cobs, good type for ensilage, but for grain gives better results in districts with a long growing season. *Golden Beauty*: A good general purpose variety late in maturing, 12-row yellow dent, vigorous grower, fairly drought resisting. *Natal 8-Row*: Yellow flint variety, medium early in maturing, very hardy type and quick grower, does extremely well in districts with a shorter growing period. A good yielder of grain, and is gaining rapid favour amongst the farmers of Natal. *Chester County*: Yellow dent early variety, not so hardy as the 8-row yellow flint, but a good general variety.

Soil Conditions for Lucerne Growing.

Richmond, Natal.—Please let me know the soil required, etc., for the cultivation of lucerne. We have a marshy tract of ground which we think could be utilized for that purpose.

Cedara School of Agriculture replies:—Lucerne grows most favourably under irrigation, but can also be grown with success on dry lands. The essentials are:—(*a*) A deep, well-drained soil, rich in lime. (*b*) Rainfall 20 to 40 inches (on dry land) according to season of distribution. (*c*) Warm locality. It is not advisable to attempt to establish this crop on a marshy tract of ground, as the plants cannot withstand "wet feet," the result of excessive moisture in the soil. After draining the soil, and provided the above conditions are present, lucerne growing may prove profitable.

Wheat Louse.*

Kokstad.—We are feeding off all our cereal crops with cattle, then harrowing and rolling. There do not appear to be so many lice, so therefore think the cattle must have eaten a large number. What is the life cycle of the louse?

Cedara School of Agriculture replies:—In early stages of attack the wheat louse often appears in spots, and ploughing under or burning straw on these has been found effective. The life cycle of the louse is simple. The forms originally seen are all females. They give birth to living young which are all females, these being born at the rate of something like one per day in warm weather. They mature in about a week. This goes on for many generations, no forms but wingless females being produced, until the grain becomes tough, when winged females appear. These migrate to various grasses. During migration, the mortality is high in a dry season owing to lack of wild grass. Ants capture the winged lice and rear them in their burrows in order to obtain their sugary excrement. In climates with severe winter, two sexes are produced in fall, either winged or wingless, and eggs are laid which pass the winter, hatching into female lice in spring. In South Africa, I believe no eggs or males have been seen.

Three species of lady beetle and a very minute wasp are the essential enemies. A fungous disease, previously unreported, was recently found on some wheat lice from your locality. This disease is probably useful in wet weather, whereas warm dry weather favours the other enemies in general. Wet weather, since cooler than dry, usually holds up the wasps, but allows the louse to go ahead. The resistance of the wheat is, however, increased by rain, and certainly the fungous disease would be favoured by it.

Gapes in Fowls.

Dalton, Natal.—Please advise treatment for gapes in fowls.

Cedara School of Agriculture replies:—This disease, which is rarely met with in this country, is due to the presence of small, thread-like worms in the windpipe of chickens. The symptoms are generally gasping, with the mouth wide open, sneezing and difficulty in swallowing. Cases of pneumonia, in which birds gasp in the above manner, are frequently mistaken for gapes, but examination of the windpipe will prove conclusively. The following treatment is recommended:—A feather, medicated with nicotine from a pipe, or turpentine, stripped of its down to within a short distance of the end, is passed into the windpipe and withdrawn after two or three turns round, when some of the worms will be attached to it. This operation should be repeated until all the worms are removed or ejected by the bird.

* See also entomological note on the wheat louse in Departmental Activities in this issue.—(ED.)

Selection of Jersey Bull.

Stellenbosch.—Please advise me of the price I ought to pay for a young Jersey bull, and the points to consider in making my selection. Will Jerseys answer in this district? Also what is the average butter-fat percentage of milk?

Elsenburg School of Agriculture replies: The price for a good, pure-bred yearling Jersey bull will be about £50; it will depend upon his individuality, his blood line, and the milk and butter-fat production of his dam and sire's dam. For individuality look for the following points in order of merit:—Trueness to breed type, constitution, soundness, quality, body conformation, sex character, size for age, and condition. With regard to blood lines, unless you are acquainted with the family lines of breeding in Jersey cattle, it would be better to send me a copy of the bull's pedigree, for advice. As to the milk and butter-fat production of the dam and the sire's dam of the yearling bull you wish to buy, any record over a 300 day lactation period of 7000 lb. of milk with a test of 4.75 per cent. or over may be considered good. They will answer certainly in your district, and have already demonstrated this.

Lung Worm in Pigs.

Inquiry.—My pigs, especially the young ones, are affected with a cough and lose condition. On examination, small worms are found in their lung tubes.

Elsenburg School of Agriculture replies: The condition is contracted by the pigs picking up eggs and young worms from the ground. The ground is contaminated by the infested pigs. Consequently, besides the attention to affected pigs, it is necessary that the pastures, pens, and yards be attended to. Dosing of pigs with a drug such as turpentine cannot be expected to be of much direct assistance on account of the location of the worms; but such dosing, notwithstanding, should be performed, for by this means intestinal worms are kept in hand, and consequently the pigs have more vitality to combat the lung affection.

As a matter of expediency it is found that, if the worm infestation is not very severe, and the condition of the pigs is kept good by judicious feeding, exercise, and hygiene, the pigs are capable of throwing off the infestation and making a complete recovery.

Utilize dry, well-drained pastures and camps. Fill in all holes in which dirty surface water can collect. Provide a clean water supply. Do not feed food in dirty yards which have been in use for long periods. Make provision, if possible, for a number of small camps rather than one or two large ones, and give these camps ample rest; for by this means many of the young worms are destroyed. To assist in cleaning up the camps, plough and sow crops.

To prevent infestation of the newly born, it would be necessary to have the sow farrowing in a well disinfected stye, and to wash the sow well before placing her therein. When these young are allowed out, they should be placed in camps which have not been utilized for running pigs for some time.

The above preventive measures will be found to be of considerable assistance also in the control of intestinal worms.

Agricultural Lime and Slaked Lime.

Simonstown.—For an onion crop grown on a light sandy soil, is slaked lime preferable to agricultural lime?

Elsenburg School of Agriculture replies: In our experience of light sandy soils, agricultural lime, i.e. finely ground limestone, gives the best results, and is less powerful in its action on the organic matter in such a soil. We have not tried the two forms of lime you mention on onions, but see no reason why this crop should be different from others.

Continuous Maize Growing with Fertilizers.

Bethlehem.—Is it advisable to grow maize continuously and rely for the maintenance of yield upon the use of fertilizer, or is there any better system?

Glen School of Agriculture replies: This question is bound up to some extent with the amount and distribution of the rainfall. Where the rainfall is abundant the yield of maize can usually be maintained by the judicious application of fertilizer. Where water, however, is the limiting factor in crop production, dependence for the maintenance of yield should be placed more on the system of farming than on the use of fertilizer. Yields of four, five, and six bags per acre according to district can more economically be maintained by growing a variety of crops, by the feeding-off of crops on the land, by winter ploughing, by fallowing, by having one legume in the rotation, than by growing maize continuously with the use of fertilizer. The return from fertilizer is so largely dependent upon the season that the farmer is liable to misinterpret its results. In 1920 a farmer gave an application of thirty bags to sixty acres of maize, and obtained a yield of 300 bags of grain, equivalent to ten bags of grain for every bag of fertilizer. In 1921, counting on this ten to one ratio, he applied thirty-seven bags to the same sixty acres, and calculated to get 370 bags, whereas he actually reaped only 200 bags.

Fertilizing is a good practice, but it must be done judiciously: otherwise money can easily be sunk in it with little hope of recovery.

Ticks on Horses.

Fauresmith.—I am sending you specimens of ticks taken off one of my horses which run on the veld. Kindly identify.

The Glen School of Agriculture replies: The specimens belong to a species known as Lounsbury's or the Argentine tick (*Margaropus withemi*, Karsch). It is a South American tick, which was probably introduced during the Boer war. It is common in many parts of the Orange Free State, and is found principally on horses. The tick is not known to be able to transmit any disease. (Read: "Ticks Found on Man, etc.," *Agricultural Journal*, July, 1920; and "Diseases, Ticks and Their Eradication," *Agricultural Journal*, February, 1921.

Feeding Potatoes to Pigs.

Bethlehem, Orange Free State.—Kindly let me know the feeding value of potatoes, and the best way in which they should be fed to pigs.

Glen School of Agriculture replies: The digestible nutrients of potatoes are as follows:—

Total Dry Matter. Per cent.	Digestible Protein. Per cent.	Digestible Carbohydrate. Per cent.	Digestible Fat. Per cent.
21·2	1·1	15·8	0·1

Potatoes are a good food for pigs, but they are not satisfactory when fed raw, and should be cooked. This is one of the few foods which it pays to cook. It is more digestible when cooked, and consequently has more feeding value. Potatoes are not used to advantage when fed alone, especially to young pigs. It is best to mix them with some grain, which is high in protein. Cooked potatoes fed along with grain and separated milk make an excellent ration for pigs.

The Value of Sheep Manure.

Vryburg.—What is the value on land of a sheep-kraal manure, dry, in the pill stage, not caked? What are its chemical contents, what particular crops is it most suitable for, and what are the quantities to be applied per acre?

Potchefstroom School of Agriculture replies:—Sheep manure is the richest of common farm manures. Fowl manure is rich in phosphates, but has not the nitrogen and potash content of sheep manure, which contains about 20 lb. nitrogen, 8.9 lb. phosphoric oxide, and 16.8 lb. of potash per ton. It is beneficial for all crops, and is a general soil improver. It will give most satisfactory results with potatoes, and other root crops and vegetables, at the rate of 4 to 8 tons per acre. To get the best value out of it, especially for grain crops, mix 100 lb. of superphosphate with every ton of sheep manure. Use 4 tons of the mixture on irrigated land, and 2 tons on dry lands. Unless phosphates are added for grain crops, the latter are likely to result in big leafy plants with little grain.

Wisconsin White Dent Maize.

Kinross.—Kindly give me some information regarding Wisconsin White Dent Maize?

Potchefstroom School of Agriculture replies:—This is a 12-row variety which matures in 120 to 130 days at this station. It would probably mature in about 130 to 135 days in your cooler climate. It is quicker maturing than Hickory and yields less. It is chiefly used for late planting, and I would use Hickory King or Potchefstroom Pearl for early planting, because they yield more, and plant Wisconsin when it is too late to plant the others. The only object in planting Wisconsin early in the season would be for early green mealies. Plant the same as other mealies, i.e. rows three feet apart, seeds 15 inches to 21 inches in the rows.

Coal Ash for Lands.

Johannesburg.—What is the value of coal ash for soil? My neighbour tells me to use it on my black vlei soil, which is rather sticky.

Potchefstroom School of Agriculture replies:—Coal ash is of little or no value as a fertilizer. It does help greatly, however, in loosening up sticky clay land. It can be applied at the rate of four to eight tons per acre.

Grading of Cream.

Bedford, C.P.—What is the manner in which cream is graded by the factory, that is, what is a first grade cream?

Grootfontein School of Agriculture replies: Cream is graded by the aid of the senses of taste and smell. Cream graders have to undergo a course of training and to pass a severe examination before being empowered to grade cream. Cream is usually graded into three grades as follows:—

First Grade.—Should not have the slightest trace of bad odours or off flavours. It should have a clean, nutty flavour without food taints, and contain no particles of churned butter. Acidity of not more than 5 per cent. is permissible so long as it is not accompanied by gas.

Second Grade.—Cream of slight staleness, overacid cream, slight taints such as weedy, cowy, tinny, etc. Slightly churned cream.

Third Grade.—Very stale cream, very acid cream, and dirty cream. Cream having very pronounced off flavour. Gassy cream. Any cream that is in the grader's opinion unfit for human consumption may be destroyed, the producer being notified in writing.

The grading of cream is performed by qualified graders, under the Dairy Industry Act, No. 16 of 1918, and is very closely checked by Inspectors appointed by the Government.

I would suggest that you apply to the Librarian, Department of Agriculture, Pretoria, for literature on the subject.

Value of Bone-meal.

Maclear.—Is there any difference between the feeding value of bones derived from animals in clean districts and those of animals from lamziekte districts?

Grootfontein School of Agriculture replies: The value of bone-meal lies in its content of calcium phosphate. What little difference there may exist between the phosphate content of bones from different areas would be quite negligible. As long as the bones are sufficiently sterilized the same results should ensure from the use of all bone-meal.

Inoculation of Seeds.

Richmond.—Can the bacterial inoculation of seeds be applied to wheat and other cereals?

Grootfontein School of Agriculture replies: Certain commercial preparations of these bacteria are claimed to give good results with cereals, potatoes, vegetables, and other cultivated plants. The indisputable fact that these bacteria only live in association with legumes effectively controverts this statement. Bacterial inoculation, at its best, is only applicable to leguminous plants.

Galls on Willow Trees.

East Griqualand.—I am posting you some specimens of galls cut from my weeping willow trees. On some trees these galls are as large as a man's head, and the trees seem to be dying.

Grootfontein School of Agriculture replies: The galls on your willow trees are caused by a bacterium known as *Pseudomonas tumifaciens* (E. Sm. and Towns). It is capable of causing similar galls on a wide variety of plants, including the common fruit trees, such as the peach, apple, etc. It is sometimes difficult to control this pest. Cut out the galls together with part of the adjacent wood, and afterwards sterilize the wound with some desinfectant. Remember to keep the knife sterilized before it is used again on unaffected trees, as otherwise you are liable to spread the disease. If the wound is large paint over afterwards, preferably with tar, but any paint will do. If too far gone it would be as well to fell the tree, and use it for firewood.

(Read article in the *Journal* of July, 1921, "Crown Gall.")

Nodular Worm in Sheep.

Graaff-Reinet.—My sheep are suffering from worms, about ½ inch long, pure white, and found mostly in the "dikderm" and "ronde derm." I see none in the fourth stomach. Is this the wireworm or some other worm?

Grootfontein School of Agriculture replies: The worm described might be wireworm (*Haemonchus contortus*), but more probably the nodular worm (*Oesophagostomum columbianum*). The latter causes small nodules in the last part of the small intestine, and the first portion of the large intestine (*caecum* and *colon*). There is no effective remedy for the nodular worm because it is so far down in the intestines that drugs given to combat it are mostly absorbed from the intestine, and thus do not reach the seat of infection in sufficient concentration to kill the worms.

The best line of treatment to adopt is that based on the life-history of the nodular worm. See article on "The Nodular Worm and the Lesions caused by it," by Sir Arnold Theiler, which appeared in the *Journal* of January, 1921.

Navel Ill in Foals.

Colesberg.—Please advise me as to the best means of treating navel ill.

Grootfontein School of Agriculture replies: Navel ill in foals is caused by organisms which enter the system through the umbilical cord at or soon after birth. It can be prevented by thorough disinfection of foaling boxes or by allowing mares to foal out in the open. Immediately after birth the umbilical cord should be ligatured with an aseptic tape, and cut an inch below the tape. The string must be painted with tincture of iodine.

For curative treatment give two drams of acetone twice daily.

Sterility in Cows.

Bethulie.—I have a cow which I cannot get into calf. What is the cause of this and what the treatment?

Grootfontein School of Agriculture replies: Sterility in cows might result from several causes, such as malformation of the womb, disease of the ovaries, metritis, vaginitis, contagious abortion, etc. If you cannot get a veterinary surgeon to examine her, you might try the following:—Syringe her out daily for a week before service with a solution of potassium permanganate, and then about an hour before she is served syringe again with a solution of bicarbonate of soda.

"Cape Aloes" as a Tonic for Stock.

Cradock.—Would "Cape aloes" serve as a tonic for stock? If so, how is it used and mixed, and what are the doses for cattle and small stock?

The Director of Veterinary Education and Research replies:—"Cape aloes" as sold for veterinary use consists of the dried juice drained from the cut ends of the leaves of various species of South African aloes. When administered in fairly large doses, it has a laxative or purgative effect in animals, and is commonly used for this purpose in the horse, the doses being 3 to 4 drachms, given in the form of a ball. Before treatment, the horse should be starved or kept on soft diet for about 12 hours, and not worked for a few days afterwards. The drug is rarely used as a purgative in ruminants because of its uncertain and unreliable action in this class of animal.

Aloes is quite a good tonic for all animals when administered in very small doses, but owing to its nauseous bitter taste, is not readily taken by stock, no matter what mixture is employed to obscure this objectionable taste. The only way in which it can be given, therefore, is by forcible drenching. This method necessarily involves rough treatment of the animals and mitigates against its usefulness for this purpose. If it is desired to employ aloes for its tonic effect, it can be given to horses and cattle in doses of ½ to 1 drachm, and to sheep in corresponding smaller doses, namely, 10 to 15 grains.

Curing Lemons.

Rustenburg, Transvaal.—We are having trouble with our lemons. We cut about three tons, stacked them in boxes and covered with a bucksail. An occasional sprinkling was administered to prevent them shrivelling. After some weeks some started getting brown in spots and blotches, becoming worse in time, although the inside of the fruit seemed to keep good.

The Division of Horticulture replies: The curing of lemons is a difficult matter, unless one has the proper equipment. The fruit should be stored in a cool, well ventilated chamber, and covered with a canvas to control the amount of moisture reaching them. The difficulty usually is in keeping them dry enough so you should not continue sprinkling them. During very dry weather, cover more tightly to prevent excessive evaporation. In California the lemons are washed, before being stored, in a solution of 1 lb. bluestone to one thousand gallons of water. This prevents brown rot and other fungous diseases. The fruit should be graded according to their degree of ripeness and the "tree ripe" fruit will, of course, be cured first. I would suggest that you store the fruit in as cool a place as possible, and not moisten them artifically in any way.

New Grasses.

Natal.—What is the best time to plant *Setaria sulcata* and *Pennisetum unisetum* at an altitude of 2000 ft.? The soil is a rather poor sandy loam, we are 36 miles from Durban and have very slight frosts in June. Molasses grass grows splendidly here, remaining beautifully green all winter, but unfortunately my cattle will not look at it unless starved to it.

The Acting Chief, Division of Botany replies: *Pennisetum unisetum* and *Setaria sulcata* would best be planted in December; but if you are able to put the grass in nursery beds under irrigation they may be planted any time from now onwards. *Setaria sulcata* is a moisture and shade loving plant, and our experience has been that it becomes coarser when grown in the open, and only one cutting can be got from it in a season. *Pennisetum unisetum* has proved itself to be most drought and frost resistant. On our dry-land station it remained green throughout the winter, and in twelve months we procured four cuttings from it. Under irrigation it grew to a height of 7-8 ft. A sackful of roots will plant an area of 10 by 12 ft. Plant in rows 3 ft. apart, and put the roots 2 ft. apart in the rows.

The *Journal* is the Department's medium of making known its activities. It contains information of value to every farmer in the Union Keep it for reference.

THE POULTRY YARD MONTH BY MONTH.

November.

By J. J. JORDAAN, Poultry Instructor, School of Agriculture, Glen, Orange Free State.

Breeding Pens.—Chicks hatched during the months of November to March are useless, puny, poor-doers, and non-profit producers, and for that reason it is advantageous to break up the breeeding pens at once if not already done. The removal also of the birds to another run will prove beneficial to them and assist in keeping up their egg output. To ensure early eggs for hatching next season (April, May, and June) a sweet, fresh run, with plenty of vegetable growth and scratching material (natural), and protection from winds and cold should be provided. Immediately the birds are removed from the run have it irrigated, and then slightly sprinkled with lime (digging this well in), leaving it for a week or ten days, and then sow it with a mixture of mealies, sunflowers, rape, or barley. Keep the crop growing by regular irrigation. The plants will give a good green food and freshen up the soil; the fresh soil will be a tonic to the birds and result in a good egg supply.

The Male Birds.—Male birds that have given profit-producing pullets are worth looking after; until December or January they are best kept confined in a movable coop and given individual attention. If put together at once they are apt to fight and do themselves damage: when the breeding season is past and they are somewhat down in condition this may be done with less risk of injury. Being confined, green food should be given in abundance, as they have not the exercise as when at liberty, the feeding of grain and mash being cut down in accordance with the increase in the green food given, about 1½ ounces of each grain and mash being sufficient per bird. Cutting down the rations will also assist in getting the birds fit for mating in the winter, when it is usually found that although the hens are laying, the cocks, not being fully through the moult, are not as fertile as they might be.

The Females.—Remove these as far as possible from the male birds; they are not so likely to fight and become discontented, with better egg-producing results. They may also be run in larger flocks than was the case during the breeding season. Towards the end of the month a number of them will stop laying. Do not think an extra feed will improve this; it is nature calling upon the egg-organs to rest, and any extra feed above that previously given will be converted into fat, not eggs. If it is intended to keep the birds for the following year's breeding this will be detrimental. When they stop laying separate those it is intended to keep, and cut down all their rations 25 per cent., except the green food. Those that have passed their best days as breeders are put in another flock and fattened for market; for this purpose they are ready responders. Place them in a small run to prevent undue exercise, and feed as follows:—*Mornings*, early, moist mash consisting of 1 part barley meal, 1 part mealie-meal porridge, and 4 parts bran wheaten; 2 pounds of fat to each 100 birds or proportionally, and about 2 oz. dry weight for each bird. *Noon*, green food *ad lib.* 2 *p.m.*, grain alternatively, broken mealies, kaffir corn, barley. 5 *p.m.*, 2 oz. of above mash, moist, for each bird. After the first or second week of this treatment they should be fit for killing and be prime.

Young cockerels not fit to be stock birds next season should also be put aside by themselves (not with hens) and got into condition for killing, getting the same feed as the hens, but in about 25 per cent. larger quantities per bird.

Eggs.—These are still plentiful and cheap this month. If not a member of an egg-circle (which every producer should be), or distant from market, or the local and natural market is very much glutted, store the eggs by preservation in water-glass or lime solution. Keep the early hatched pullets back from laying as much as possible by frequent changes to different runs; to this end the rations must be on the low side and of a fattening nature, for foods rich in proteins will hurry on egg production, with bad results later.

Chickens.—Watch these for chicken pox and roup, and if an outbreak shows itself treat at once. Insects will be most troublesome; keep them in check, and if required and details furnished regarding the species, instructions as to treatment will be sent at once.

Incubators.—Before these are put away for the season replace each part worn, missing or broken, and thoroughly clean and disinfect the incubator both inside and out.

Weather.—Heavy rains may be expected during the month; see that the drainage is good and that no pools of water are allowed to remain about the runs, or worms may surely be expected to show themselves.

Thoroughbred Stallion "Wilkins Micawber."—Grootfontein School of Agriculture, Middelburg, Cape Province.

STAFF: APPOINTMENTS, CHANGES, ETC.

1/9/22 H. H. Storey, Mycologist, Division of Botany, transferred to Mycologist's Office, Durban, and as Officer-in-Charge, Natal Herbarium.

8/9/22 H. L. Anderson, appointed Egg Inspector. Stationed at the Docks, Capetown.

16/9/22 D. H. Heyink, appointed Lecturer in Botany, School of Agriculture, Glen, Orange Free State.

30/9/22 E. J. Macmillan, Under-Secretary for Agriculture (Education), retired on pension.

MOVEMENTS OF OFFICERS.

The Principals of the Schools of Agriculture will attend an adjourned Conference of Principals, called by the Secretary for Agriculture, and to be held under his chairmanship, at Pretoria in the beginning of November, 1922.

NOTES FROM THE "GAZETTE."

Attention is drawn to the following matters of interest which appeared in the *Union Government Gazette*:—

(Abbreviations: "Proc."-Proclamation, "G.N."-Government Notice.)

Gazette. *No.*	*Date.*	*Item.*
1266	15/9/22	The plant known as "khaki weed" has been proclaimed a noxious weed (Proc. No. 142.)
		A levy of 3s. is payable on the 1st January, 1923, by each adult male inhabitant of the native locations concerned in the advance made by the Government in respect of certain dividing fences in the Division of Peddie (Proc. No. 143).
1266 1267 1268 1269	15/9/22 22/9/22 29/9/22 6/10/22	The compulsory disinfection and dipping of cattle as prescribed by the Stock Diseases Regulations has been ordered: (*a*) Every three days in the three-day dip for portions of Waterberg; (*b*) every five days in the five-day dip for portions of Camperdown, Ixopo, Tabankulu, Lower Tugela; (*c*) every seven days in the seven-day dip for portions of Lydenburg, Ermelo, Middelburg (Transvaal) (G.N. Nos. 1495, 1544, 1588, 1632, 1674).
1266 1267 1270	15/9/22 22/9/22 13/10/22	The compulsory dipping of sheep has been ordered as follows: For Sutherland, Steytlerville, and Jansenville, within the period 1st November, 1922-31st December, 1922; for Glen Grey, Queenstown, Burghersdorp, Molteno, Hofmeyr, Cradock, Tarkastad, for the period 1st November, 1922-31st January, 1923 (G.N. No. 1515); for Victoria East, for the period 1st October, 1922-31st December, 1922; for Herschel, Bredasdorp, Swellendam, Malmesbury, Clanwilliam, Piquetberg, Tulbagh, Paarl, Cape, Stellenbosch, Robertson, Montagu, Caledon, for the period 1st October, 1922-31st January, 1923 (G.N. Nos. 516, 1575); for Nqutu, 1st-30th November, 1922; Ladysmith, 1st November, 1922-31st January, 1923 (G.N. No. 1667); for Harrismith and Vrede, 1st December, 1922-31st January, 1923 (G.N. No. 1668).
1269	6/10/22	A levy of 1s. 6d. in respect of each head of cattle is payable by all native stock owners in the Unhlanga Native Location (Sub-district of Indwe) concerned in the erection of and dipping in the dipping tank, towards the cost of which the Government granted advances. The levy is payable on the 1st January, 1923, and thereafter on the same date in each ensuing year until the liability is extinguished (Proc. 153).
		Certificates of incorporation, in terms of the Registration of Pedigree Live Stock Act, have been granted to the Africander Cattle Breeders' Society and the South Devon Breeders' Society of South Africa (G.N. No. 1629).
		Brands registered in respect of stock in the Cape and Orange Free State, for the quarter ended 30th June, 1922, are published in G.N. Nos. 1633 and 1641.
1270	13/10/22	The definition "authorized dip" (scab regulations) has been further amended, and the definitions of such dips as (1) home-made lime and sulphur dip, (2) manufactured lime and sulphur dip, and (3) manufactured tobacco extract or nicotine are referred to in the new order (G.N. No. 1686).
		The eastern half of the Beaufort West District has been declared a semi-protected area for purposes of the Scab Regulations (G.N. No. 1687).
		Regulations for the prevention of equine mange are in force as from 1st November, 1922, for the Territory of Basutoland (Notice No. 89, *Official Gazette* No. 1105).

THE SOUTH AFRICAN AGRICULTURAL UNION.

Annual Congress, 1922. Bloemfontein, O.F.S.

JOURNAL OF THE DEPARTMENT OF AGRICULTURE.

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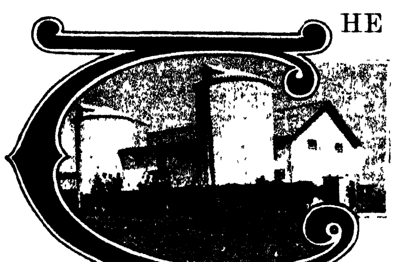
THE REPORT OF THE DEPARTMENT OF AGRICULTURE.



THE present issue completes the fifth volume of the *Journal*. Published monthly since April, 1920, it has given valuable information to the farmer and has served as a link between him and the Department of Agriculture. Essentially of a departmental nature, it has made known the results of agricultural experiments and investigations in the Union, given seasonable advice on many branches of farming, and discussed questions of moment to every farmer in South Africa. The *Journal* cannot, however, convey in full measure the whole work of the Department, much of which can only be presented to the public in the form of a review covering a stated period, or in a collective form, and this is done in the Department's annual report, which is published in blue-book form. But realizing that in that form only the report did not obtain sufficient publicity among the farmers of the Union, it was decided to enlist also the *Journal* for the purpose. The last annual report was accordingly published in the January, 1922, number of the *Journal*, and the present issue is devoted to the succeeding report, that for the year ended 30th June, 1922. The report has necessarily to be circumscribed, limited space preventing reference to a great many items, but it is trusted it will enable farmers to realize the many directions in which the problems of agriculture are receiving the attention of the Department.

ANNUAL REPORT OF THE SECRETARY FOR AGRICULTURE.

Year ended 30th June, 1922.

Secretary for Agriculture: P. J. DU TOIT.

1. *Freight Rates to European Ports.*—The prosperity of the farmer being largely dependent upon the cost of transport to the markets, the Minister of Agriculture used every endeavour to secure a reduction of freight and railway rates. Excluding speculation and forced sales, every reduction in the transport charge may be said to increase the income of the farming community to the extent of that reduction. The following comparative freight rates as at June, 1921, and June, 1922, show the benefits which have been secured for the agriculturist in that respect. Taking the quantity of these products exported in 1921, the reductions in freight, assuming an equal quantity exported in 1922, show an additional income of £1,200,000 approximately, of which wool, maize, maize meal and kaffir corn account for nearly £1,000,000.

Commodity.	June, 1921.	June, 1922.
Bark, Wattle (in bags) ...	(Fluctuating)	32s. 6d.
„ „ (pressed) ...	„	20s. 6d.*
„ „ „ ...	„	15s.†
„ „ Solidified Extract of ...	—	35s.
Beans, n.o.e. (per 2240 lb.) ...	65s.	55s.
Buchu Leaves ...	2d. per lb.	2d. per lb. less 20 per cent. discount.
Corn and Grain (per 2000 lb.)—		
Maize, Maize Meal, Kaffir Corn, Hominy Feed, and Hominy Chop ...	40s.	21s. 6d.
Oats ...	45s.	35s.
Barley ...	35s.	30s.
Rye ...	37s. 6d.	37s 6d.
Cotton (per cubic foot) ...	60s.	35s.
Cotton Seed (per 2240 lb.) ...	60s.	45s.
Feathers, Ostrich (*ad valorem*) ...	50s. per cent.	40s. per cent.
(per 40 cubic feet) ...	120s. less 20 per cent. discount	100s. less 20 per cent. discount.

* Per 2000 lb.

† Per 40 cubic feet (pressed to average density of 55 cubic feet).

Commodity.	June, 1921.	June, 1922.
Fodder, Forage, Hay, Lucerne, and Oat-hay (pressed) (per 2240 lb.)	72s. 6d.	40s.
Fruit, Dry, n.o.e. (per 2240 lb. or 40 cubic feet) ...	80s.	50s.
„ Canned (per 2240 lb. or 40 cubic feet)... ...	80s.	50s.
Hides, Dry (per lb.)	$1\frac{1}{8}$d.	$\frac{5}{8}$d. less 20 per cent. discount.
„ Wet (per 2240 lb.)	80s.	55s. less 20 per cent. discount.
Horns, n.o.e., in bags (per 30 cubic feet)	50s.	30s. less 20 per cent. discount.
„ „ in bales (bales not to exceed 30 cubic feet)	50s. per bale	30s. less 20 per cent. discount per bale.
Millet Seed (as Maize).		
Mohair	$1\frac{1}{8}$d. per lb.	$\frac{5}{8}$d. less 20 per cent. discount.
Nuts, Ground, with shells (per 2240 lb.)	120s.	90s.
„ „ without shells (per 2240 lb.)	80s.	40s.
Onions, in cases (per 40 cubic feet)	102s. 6d.	60s.
Raisins, in bags (per 2240 lb.)	75s.	50s.
„ in boxes (per 40 cubic feet)	75s.	50s.
Seed, Lucerne (per 2240 lb.)	112s. 6d.	50s.
„ Mafurerua or Sunflower (per 2240 lb.)	100s.	45s.
Skins (at shippers' option)	$1\frac{1}{8}$d. per lb. or 60s. per 40 c. ft.	$\frac{5}{8}$d. or 40s. less 20 per cent. discount.
Tobacco, manufactured (per 40 cubic feet)	102s. 6d.	92s. 6d.
„ unmanufactured (per 40 cubic feet) ...	70s.	60s.
Wax, Bees (per 40 cubic feet)	120s.	80s.
Wool, Grease (per lb.)	$1\frac{1}{8}$d.	$\frac{5}{8}$d. less 20 per cent. discount.
„ Scoured (per lb.)	2d.	1d. less 20 per cent. discount.

COOL CHAMBER CARGO.

Commodity.	June, 1921.	June, 1922.
Beef, per lb.	$1\frac{1}{4}$d.	$\frac{3}{4}$d.
Eggs, per 40 cubic feet	150s.	90s.
Bacon	150s. per 40 c. ft.	$\frac{5}{8}$d. per lb.
Cheese	120s. per 40 c. ft.	$\frac{5}{8}$d. per lb.

2. *Production of Food and Drink.*—The imports and exports of articles of food and drink are an index of production. South Africa always had a considerable adverse balance in this respect. The following return shows that in 1921-22 the balance was in its favour. In food alone, South Africa exported to the value of £1,700,000 in excess of imports.

VALUE OF IMPORTS AND EXPORTS FOR THE YEAR ENDED 30TH JUNE, 1922.

Article.	Imported.	Exported.
	£	£
Ale, Beer, etc.	30,215	13,300
Butter and Substitutes	107,709	237,499
Cheese	7,073	20,330
Coffee	570,507	2,354
Confectionery and Jams...	264,322	28,890
Corn, Grain, and Meal Bran—		
Bran	736,797	2,807
Kaffir Corn		9,096
Maize		1,722,311
Maize Meal		687,319
Oats		21,837
Flour and Meal (wheaten)		29,150
„ (ground in Bond)		11,838
All other kinds		8,959
Eggs	14,460 (*a*)	179,153
Fish, Dried and Cured	83,632	35,389
Fresh and Frozen	3,722	
Crayfish	—	321,539
Other Preserved	138,220	123
Fruit, Dried and Preserved	120,103 (*b*)	343,260
Fruit, Fresh—		
Citrus	9,165	180,495
Deciduous		182,791
Grapes		85,795
All others (including Nuts)		28,230
Lard	7,179	370
Meats, Fresh and Frozen	2,382	14,103
Preserved and Cured	71,883	28,373
Milk, Condensed...	357,278	42
Spirits	615,266	16,506
Sugar	428,092	1,083,864
Sugar Products	39,626	3,967
Tea	463,327	7,901
Vegetables, Fresh—		
Potatoes	16,475	16,798
All other	1,435	11,084
Wines	52,457	59,276
All other articles of Food and Drink	1,206,808 (*c*)	18,969
TOTAL	£5,348,183	5,413,766
All kinds of Food	£3,616,411	5,314,429
All kinds of Drink	£1,731,772	99,337

3. *Market Prices.*—The following market prices of the principal agricultural products and live stock are given to show a comparison between 1922 on the one hand and 1913 and 1914 (pre-war) on the other:—

(*a*) Mostly preserved.

(*b*) Includes nuts which are shown differently in the exports.

(*c*) Nearly half represented by rice (£480,446) and pickles (£105,635).

Product and Centre.	1913.		1914.		1922.	
	January.	June.	January.	June.	January.	June.
Wheat (200 *lb.*)—						
Capetown	18s.	15s.	18s.	19s.	24s. to 24s. 6d.	24s. 6d. to 25s. 6d.
Durban	—	—	—	—	—	—
Johannesburg ...	24s.	21s.	20s.	25s.	20s. to 24s. 6d.	25s. 3d. to 26s. 3d.
Mealies (200 *lb.*)—						
Capetown	—	—	12s. 6d.	11s.	12s 6d. to 13s. 6d.	14s 6d. to 15s. 6d.
Durban	20s. to 23s. 6d.	15s.	13s.	18s.	10s. 6d. to 13s.	12s. to 15s. 6d.
Johannesburg ...	22s.	11s. 10d.	8s. 10d. to 9s. 6d.	8s. 10d.	8s. to 10s. 9d.	10s. to 11s. 6d.
Barley (150 *lb.*)—						
Capetown	12s.	12s. 9d.	12s.	—	14s. to 15s.	12s. 6d. to 15s.
Johannesburg ...	14s. 3d.	13s. 6d.	12s. 6d.	13s. 6d.	12s. 3d. to 14s. 6d	9s. 9d. to 10s. 6d.
Oats (150 *lb.*)—						
Capetown	9s.	9s. 9d.	7s. 10d.	8s.	11s. to 11s. 6d.	12s. to 13s.
Durban	9s. to 13s.	9s. 6d. to 13s.	10s. to 13s. 6d.	8s. 6d. to 11s. 6d.	9s. 6d. to 13s. 6d.	8s. to 10s. 6d.
Johannesburg ...	12s.	12s.	10s.	12s.	12s. 3d. to 15s.	9s. 4d. to 10s. 3d.
Oat-hay (100 *lb.*)—						
Capetown	4s.	4s.	3s. 3d	4s.	5s. to 5s. 6d.	5s. 6d. to 6s.
Durban (Forage) ...	5s. 10d. to 6s. 10d.	3s. 9d to 6s. 3d.	5s.	4s. 3d.	4s. 6d. to 6s.	5s. to 6s. 6d.
Johannesburg ...	6s. 6d.	6s. 3d.	4s. 9d.	5s. 9d.	4s. to 8s.	2s. to 8s. 6d.
Lucerne Hay (100 *lb.*)—						
Capetown	6s.	4s.	5s.	6s.	4s. 6d. to 6s. 5d.	6s. to 6s. 6d.
Durban	4s. 6d.	5s. 6d. to 6s.	6s. 3d.	4s.	4s. to 5s. 6d.	4s. to 8s.
Johannesburg ...	5s. 3d.	5s. 9d.	4s. 3d.	5s. 9d.	3s. 6d. to 6s.	4s. to 6s. 6d.
Potatoes (150 *lb.*)—						
Capetown	21s.	18s.	7s.	14s. 6d.	6s. to 12s. 6d.	7s. 6d. to 15s.
Durban	16s. 6d.	18s.	13s. 6d.	13s 6d.	7s. to 15s.	7s. to 15s. 6d.
Johannesburg ...	13s. 1d.	21s. 9d.	12s. 6d.	15s.	2s. 6d. to 9s. 3d.	2s. 6d. to 13s. 6d.
Onions (120 *lb.*)—						
Capetown	6s. to 7s.	8s. to 10s.	3s. to 5s. 6d.	2s. 6d. to 6s.	4s. 6d. to 9s.	6s. to 11s. 6d.
Durban	—	—	—	—	11s. to 30s.	9s. to 14s.
Johannesburg ...	9s. to 13s.	11s. to 12s. 9d.	6s. to 8s. 6d.	3s. to 12s. 6d.	3s. to 12s. 6d.	11s. 6d. to 13s.

Product and Centre.	1913.		1914.		1922.	
	January.	June.	January.	June.	January.	June.
Tobacco, Boer (per lb.)—						
Capetown	4d. to 1s.	3d. to 7d.	3d.	3d. to 8d.	1s. 6d. to 1s. 6d.	6d. to 1s.
Johannesburg ...	1d.	1½d.	2d.	1s.	—	—
Beans (200 lb.)—						
Capetown	36s. to 47s. 6d.	40s. to 40s.	—	19s. 6d. to 30s.	27s. 6d. to 75s.	30s. to 55s.
Durban	40s. to 50s.	30s. to 37s. 6d.	32s. 6d. to 37s. 6d.	26s. to 24s.	14s. to 42s.	15s. to 40s.
Johannesburg ...	25s. to 42s. 6d.	19s. 6d. to 50s.	15s. 3d. to 32s. 6d.	15s. 6d. to 34s.	12s. to 34s.	16s. to 30s.
Beef (per lb.)—						
Durban	2·6d. to 4·6d.	2·1d. to 2·9d.	2·1d. to 4·6d.	4d.	3d. to 8d.	3d. to 8d.
Johannesburg ...	3d. to 5·7d.	3·4d. to 4·2d.	3·9d. to 5d.	3d. to 4·3d.	3½d. to 5⅝d.	2·1d. to 3·6d.
Mutton (per lb.)—						
Capetown	—	—	—	—	5½d. to 7½d.	6d. to 8d.
Durban (Feb.) ...	4½d.	3d. to 5⅛d.	5d. to 5½d.	4d.	3d. to 9d.	3d. to 7d.
Johannesburg ...	6½d. to 7d.	5d.	5¼d. to 5½d.	4d. to 1¾d.	6d. to 6¾d.	4d. to 6½d.
Fresh Butter (per lb.)—						
Capetown	1s. 5d.	1s. 3d.	1s. 4d.	1s. 3d.	1s. to 1s. 4d.	1s. 3d. to 1s. 6d.
Durban	1s. 3d.	1s. 5d.	1s. 3d.	1s. 5d.	10d. to 2s.	1s. 9d. to 3s.
Johannesburg ...	1s. 3d.	1s. 3d.	1s. 2d.	1s. 3d.	7d. to 1s. 3d.	1s. 3d. to 1s. 6d.
Eggs (doz.)—						
Capetown	1s. 6d.	1s. 10d.	1s. 6d.	1s. 10d.	1s. to 1s. 6d.	2s. 6d. to 3s.
Durban	2s. 4d.	2s.	2s. 1d.	2s.	10d. to 2s.	1s. 9d. to 4s. 3d.
Johannesburg ...	2s.	1s. 9d.	1s. 4d.	1s. 5d.	1s. to 1s. 9d.	1s. 3d. to 2s.
Cattle, Slaughter (each)—						
Capetown	—	—	—	—	£9. 5s. to £15. 10s.	£8. 15s. to £13. 10s.
Johannesburg ...	£5 to £16. 10s.	£5. 10s. to £15	£4. 15s.	£4. to £13. 10s.	£5 to £15	£5. 10s. to £14
Sheep (each)—						
Capetown	—	—	—	—	13s. to 18s.	13s. to 22s.
Johannesburg ...	8s. to 22s. 6d.	12s. 6d. to 21s. 6d.	9s. to 25s.	5s. to 18s. 6d.	8s. to 25s. 6d.	9s. 6d. to 24s.
Pigs (each)—						
Capetown	—	—	—	—	25s. to 85s.	25s. to 85s.
Durban (Pork) ...	4½d. to 5⅞d.	7d. to 8¼d.	5d. to 6¼d.	4½d. to 6¼d.	3d. to 5d.	5¼d.
Johannesburg * ...	4¼d. to 5d.	2d. to 5d.	3d. to 4½d.	2d. to 4¾d.	2¼d. to 7d. *	2d.*

* Per lb. live weight.

4. *Export Values.*—Based on Customs returns, the following were the average export values of the commodities shown:—

Commodity.	1913.	1914.	1921.
Wool, Scoured (per lb.)	17·7d.	18·2d.	21·4d.
„ Grease „	7·48d.	7·2d.	7·9d.
Mohair „	21·1d.	10·6d.	8·18d.
Ostrich Feathers „	57s. 9d.	35s. 5d.	31s. 1d.
Hides „	8·9d.	8·9d.	6·1d.
Skins, Goats „	8·6d.	8·2d.	9d.
„ Sheep „	6·6d.	5·95d.	6·1d.
Wattle Bark (per ton of 2000 lb.)	£4. 4s. 11d.	£4. 8s.	£5. 14s. 5d.
Sugar („ „)	£17. 9s. 9d.	£18. 6s. 7d.	£29. 19s. 9d.
Wines (per gallon)	49·8d.	47·6d.	59·5d.

5. *Advisory Board.*—The Board, which is identical with the Executive of the South African Agricultural Union, met twice and rendered valuable assistance. The constitution of the Board has been the subject of discussion by other agricultural bodies, which have made proposals for their own representation on the Board. The matter appears to be still under consideration.

6. *Co-operative Societies Act.*—Special legislation to facilitate the registration and work of co-operative societies, which hitherto was in force in the Transvaal and Orange Free State only, was extended to the Cape and Natal Provinces as well. The experience of the last 18 years or so was availed of for enacting legislation which embodies the principles that have led to success in other countries as well as in this, while the faults and disabilities in previous legislation were eliminated. Further, the Transvaal and Orange Free State laws made provision only for societies with unlimited liability, while the present Act provides for societies with limited liability as well. A new *Land Bank Act* passed during the same Session enables societies with limited liability as well as with unlimited liability to obtain assistance by means of loans from the Land Bank. Societies already in existence not conforming in all respects to the new law, but which have adopted the main principles of co-operation, can be admitted for registration under the new Act. The two Acts mentioned will be a potent means of furthering agricultural co-operation.

7. *Agricultural Produce Grading Act.*—This Act, passed during the last Session of Parliament, introduced a new principle from which it is expected that far-reaching results will accrue. Since 1914 the grading of export fruit was provided for, and since 1917 the grading of other agricultural products, exclusive of wool, mohair, hides, skins, and ostrich feathers. In the Act of 1922 hides and skins were brought under the 1917 Act, and provision was made for the grading of agricultural products intended for sale in South Africa. The grading of cheese sold in South Africa is already undertaken for and at the request of certain producers. The grading of bacon can be undertaken in terms of this Act, while the grading of certain other products will probably become practicable in course of time. One of the main features of the Act is that

it establishes the principle of self-help. In the Act the Minister of Agriculture is empowered to impose a special fee in respect of graded products for the purpose of providing funds which could be used, with the approval of the organizations concerned, for improvement of industries in respect of which the fees are levied. Such improvement can be obtained, for instance, by providing itinerant instructors, conducting investigations, securing better organization, etc. The manner in which this provision will operate has been explained in more detail in the paragraph dealing with the grading of bacon. The special fee can be imposed in respect of export products as well, and has already been imposed in connection with export fruit.

8. *Fencing Act.*—The *Fencing Act* of 1912 was extended to jackal-proof fencing. This measure is of great economic benefit to sheep farmers who suffer, on account of the depredations of jackal, depreciation of the quality and quantity of wool, deterioration of the veld, and a smaller percentage of lambs born. Under the Act just passed, farmers who wish to erect jackal-proof fencing in a district which has asked that the Act be proclaimed therein, will be able to call upon the adjoining owners to contribute to such fencing, and application can be made to the Land Bank for advances to meet the cost, as in the case of ordinary fencing.

9. *Agricultural Education and Research: Co-ordination.*—The committee appointed by the Minister of Agriculture to co-ordinate agricultural education and research, and referred to in the previous year's report, presented its proposals. The committee was also required to consider the training of teachers for giving instruction in nature-study and agriculture. It may fairly be claimed that the committee has laid the foundation of agricultural education in the primary and secondary schools. It indicates how teachers could be suitably trained both for teaching nature-study in primary schools and for giving agricultural instruction in secondary and high schools. It recommends the establishment at carefully selected centres of special agricultural secondary schools at which the large number of boys who now leave school after completing the primary school course can pursue an agricultural course. These are intended particularly for farm boys. The committee further proposes a complete system of mutual assistance between the Agricultural Faculties of the Universities of South Africa and Stellenbosch and the Schools of Agriculture and Technical Divisions of the Department, that is to say, an interchange between the Faculties and the Agricultural Schools of members of the teaching staff, as well as teaching facilities, when such assistance is required and available; deliberations in regard to research and experimental work between members of the Faculties and of the Schools, as well as between the Faculties and the Divisions; divisional laboratories being made available to the Faculties for the purposes of research; lectures being given by members of the Divisions to University students on special subjects, and Experiment Stations of the Department being made available to the staff and students of the Universities. It will be seen that, as regards research and teaching, the Faculties and Divisions of the Department will co-operate, and that not only co-ordination of work, but also facilities for more work, are provided for at a minimum of expense. To some extent these

proposals were given effect to, even before the committee's report appeared; for instance, several officers of the Veterinary Education and Research Division have been giving lectures at the Transvaal University College, and a member of the Elsenburg Agricultural School staff lectures at Stellenbosch University. An officer of each of the two Universities has also been afforded an opportunity of doing extension work with the assistance of the Department. Lastly, the committee proposes that agricultural training be provided for women farmers. Throughout the proceedings the members of the committee showed a common desire to arrive at solutions which they consider best for the country.

10. *Agricultural Education : The Schools.*—The technical staff at the Schools of Agriculture numbered 137, as in the previous year. Provision was made for the teaching of a few subjects for which extra-mural lecturers had to be employed. Housemasters were also appointed in order to relieve the vice-principals of a large amount of administrative work which could as well be performed by less highly paid officers, thus freeing the vice-principals for technical work.

The numbers in attendance at the schools were:—

	1921-1922.	1920-1921.
Diploma course	252	273
Special course in sheep and wool	27	15
Special course in dairying	10	14
Special course (returned soldiers)	—	67
Practical course	18	—
Other special courses	15	14
Wine-making course	27	29
Winter vacation course	542	378
Total	891	790

Much important work is being done in research and investigation, and the country is undoubtedly reaping great benefit therefrom. The matters under investigation are numerous, but some of them are referred to in the reports of the principals.

The experiment station at Winklespruit, on the south coast of Natal, was closed owing to its unsuitability for the experiments required to be undertaken. As soon as funds permit a fully equipped station should be provided on the north coast to serve the sugar industry in particular.

An experiment station was opened at Bathurst in the Cape Province, principally for investigating the wheat problems of the south coast, which area years ago produced large and remunerative crops, and is believed capable of being made productive of wheat again. At this station fruit and other crops are also being experimented with.

More extension work, that is, itinerant instruction, was given by the staff of the schools than previously was possible. Approval has been given, however, for the creation of a Division whose duty it will be to regulate this work. At present such work is undertaken by officers of the schools and of the divisions, but without arrangement as between the schools and the divisions. Strictly speaking, this work falls to officers of the schools, but the schools are not yet so equipped that the work can be entirely left to them. Hence the

officers of some divisions are called upon to do a large amount of extension work. It will be the duty of the new Division of Extension Work to regulate the activities of both the schools and the divisions in this respect, and to provide for systematic instruction throughout the country, by arranging what is known as "Farmers' Days" or "Farmers' Weeks," utilizing in different parts of the country the services of officers best able to meet the needs of those parts, concentrating groups of officers at selected centres, and so making the instruction varied, attractive, and as useful as possible. In short, the Division will substitute group instruction at suitable places, where farmers will be asked to come together, in place of individual instruction to farmers, thereby saving the time of officers and reaching a larger number of farmers. Advice to individual farmers will not be eliminated, as special circumstances will require such visits, but it will be very much restricted compared with the past system.

Owing to the financial circumstances of the country agricultural scholarships for oversea study were reduced in number, twelve being awarded as against twenty in the previous year. Moreover, no provision can be made for such scholarships for next year. The number receiving scholarships at present is 43. During the year under review 11 returned scholars received technical appointments in the Department.

Reference to the shortage of staff quarters at several of the agricultural schools has to be repeated. It is not conducive either to discipline or to satisfactory work to have officers live away from these institutions. As rent is paid by occupants of Government quarters, there seems to be no strong reason why the provision of such quarters should be delayed.

11. *Training Farms.*—The two farms are doing good work in the training of inexperienced men who desire to make farming their profession. The number of students enrolled at Beginsel, Standerton, is 35, and at Guba Park, Indwe, 41. The latter farm is not entirely suitable for the purpose for which it was established, and the transfer of the work done there is under consideration. For various reasons it has been found advisable to give similar practical training at the agricultural schools as well; and to the extent to which accommodation is available a one-year's course for this purpose has been instituted at the schools.

The courses at the two classes of institution naturally vary, owing to the fact that the schools were established primarily for a diploma course (occupying two years), in which teaching of agricultural science occupies half the time, while the teaching at the training farms is almost entirely of a practical kind, and all the manual labour—ploughing, stock-feeding, milking, etc.—in connection with the farm operations is given by the students.

12. *Division of Agricultural Economics.*—This was referred to in my last report. An officer of the Department was recently selected to study the Markets and Crops Divisions of the United States Department of Agriculture and also to investigate the conditions obtaining on the principal markets of that country. The business side of farming, namely, economic production and marketing, requires urgent attention. Such a Division could give valuable assistance in working out the cost of production of various crops, showing where unprofitable production takes place, suggesting means

of reducing such cost and investigating marketing conditions with a view to their improvement.

13. *Division of Chemistry.*—Steps were taken for the proper organization of this Division, which had been in a state of disruption since 1910. Not only was there no cohesion between the two most important sections, one located at Pretoria and the other at Capetown, but steps were actually in progress for the constitution of a third section independent of the other two. The different sections have been placed under one head, who also co-ordinates the research work done by the lecturers in chemistry at the agricultural schools. With close co-operation of the different laboratories, the work should be better apportioned, the various lines of work arranged without overlapping, and work generally facilitated by closer contact of research officers with one another.

14. *Staff: Division of Entomology.*—This important Division is still seriously understaffed. Two of the senior officers who resigned to take up professorships in universities have not yet been replaced. Important investigations have in consequence to be left in abeyance.

15. *Payment for Technical Services.*—A scheme of payment for the services of veterinary officers for private work was instituted. The tariff is a low one. Much less advantage was taken of the scheme than was anticipated, the amount realized in twelve months being only £130. The Government has, however, decided to extend this practice to other services which are of benefit to the individual only. It will probably be brought into force in connection with the classing of sheep for breeders.

16. *Sheep and Goats.*—The following is the number of sheep and goats in the Union as compared with last year:—

	30th April, 1921.	30th June. 1922.
Total sheep	31,729,512	35,091,980
Total goats	7,836,696	8,960,954
Total sheep and goats	39,566,208	44,052,934
Total losses of sheep and goats* (from disease and drought)	2,123,030	*1,846,711

The number of flocks infected with scab was 11,681 as compared with 15,307 in the previous year; progress has, therefore, to be recorded, notwithstanding the severe drought during the last few months of the report year.

As from 1st April, the conditions under which sheep inspectors were employed were altered. Shortly after Union, inspectors were given pension rights. A few years later it was recognized that as inspectors were appointed to eradicate scab and not to control it, it was a wrong principle to give them pension rights—a system which was tantamount to recognition of permanency of tenure and inconsistent with eradication of the disease—and all new appointments were thenceforth made without pension rights. The inspectors who already enjoyed those rights retained them, however. From the 1st April last all inspectors were placed on a temporary basis, thus removing all future pension rights. Further, a bonus system was

* Exclusive of lambs and kids died, which numbered in the year 1920–1921 1,263,428 and 148,675 respectively.

introduced in place of annual increments, only inspectors who have been able to show progress participating. The bonuses will range from £20 to £50 per annum, according to the amount of progress made. This reorganization resulted in a saving of about £20,000, and is expected to lead to greater efficiency at the same time.

The South African Agricultural Union, which is the body recognized as representing the farmers of the Union, has at several successive congresses recommended more stringent legislation with a view to securing the eradication of scab in the near future. There seems to be no doubt that the majority of farmers are in favour of such a measure. The present financial circumstances of the country appear to demand steps which will free the Union as soon as possible from the annual payment of £180,000. Without such steps this expenditure and the stigma on the country are likely to remain indefinitely. The cry is for more Government supervision. No means of affording stricter control by the Government is known except at considerably greater expenditure. What is wanted is a means of ensuring greater activity by a certain class of farmer.

17. *East Coast Fever*.—Taken as a whole progress was made in the work of eradicating this disease, more particularly in the Transvaal. Notwithstanding the spread of the disease to other clean districts, the following comparative table shows the position in this Province as at 30th June, 1921 and 1922, respectively.

Infected Farms.	30th June, 1921.	30th June, 1922.
Lydenburg	3	1
Piet Retief	13	12
Pietersburg	14	6
Barberton	16	3
Zoutpansberg	45	24
Pretoria	87	93
Carolina	—	2
Waterberg	—	4
Middelburg	—	1

In the Piet Retief District, where complete eradication was nearly attained, illicit movements from Swaziland reintroduced the disease to a number of farms. In Pretoria District a considerable improvement is recorded, notwithstanding the larger number of outbreaks as compared with a year ago, due to dipping tanks on a number of infected farms only becoming available at the end of 1921. Farmers are now convinced of the effectiveness of dipping, and few losses are being sustained.

The introduction of the disease into Carolina, Waterberg, and Middelburg Districts, presumably by illicit movements of cattle, is most disappointing; but, fortunately, dipping operations could be put into force with little delay, and the hope is entertained that the disease will be confined to the few farms infected. In Natal an appreciable improvement was effected during the year, notwithstanding setbacks in eight districts. The improvement is attributed by the Principal Veterinary Officer to closer supervision, which was made possible by increase of the field staff.

In the Cape Province a case of the disease was discovered in Komgha District after that district had been free from the disease for a number of years. It must have been introduced from the Transkeian Territories, in which, unfortunately, the position is

rather worse than in the previous year, 58 outbreaks being recorded in 1921-22 as against 56 in 1920-21. There was a recrudescence in four districts; but in Eastern Pondoland an improvement has been effected.

There is no doubt that by a larger expenditure of public funds greater progress can be made. From a purely veterinary point of view such a course is desirable. It is seriously doubted, however, whether eradication is possible by a lavish expenditure of public funds. The greater the number of Government officials employed to supervise dipping, the more are farmers likely to rely upon Government, and the less would be their own efforts. Regular and careful dipping will eradicate the disease from infected centres, as has been proved over and over again. Recrudescence of the disease is due to slackness in dipping operations. Farmers admit that they get tired of the monotony and drudgery of the work. Under these circumstances it has been said by prominent farmers that they require Government supervision in order to keep them up to the mark. But, if this is so, it seems fair to require payment for these services. The expenditure from public funds for eradication of disease is at present at the rate of about £80,000 per annum. This is exclusive of the expenditure in native areas, which, however, is paid for by the natives themselves. Payment by farmers in infected districts, even of a portion of the expenditure now incurred, would increase supervision by themselves, because they would endeavour to get rid of the payment, and their supervision in their personal interests would be more effective than that of Government officers. If this contention is correct, it would be good business for farmers in infected districts to agree to shoulder such a burden.

18. *Anthrax.*—This disease is widely prevalent. The Principal Veterinary Officer reports that the losses from this cause amongst farm live stock are greater than the total losses from all other contagious diseases. Fewer outbreaks were reported, however, during the past year than in the previous one. Farmers realize the danger from this disease, but there is no doubt that anthrax is not recognized in many cases of death. One of the principal contributory causes to outbreaks is also carelessness in the burial of carcasses. The Principal Veterinary Officer recommends, as one of the chief means of combating the disease, systematic inoculation. This would require a certain amount of supervision, and is at present being considered. The prevalence of anthrax, as has been pointed out on previous occasions, is not only a direct danger, but also an indirect one, owing to the steps which other nations might take to keep out infection which may be conveyed by raw animal products. In the previous year's report it was stated that the International Labour Conference (at Geneva), called by the League of Nations, would consider whether legislation should be recommended for the disinfection of wool in the countries of origin. That conference, which met in October, 1921, came to the conclusion that it could not make any recommendation without the fullest investigation by a committee specially appointed for the purpose. Such a committee was nominated, consisting of representatives of the large manufacturing countries, as well as the principal producing countries. South Africa is also represented on that committee, which, after preliminary correspondence, will meet in London towards the end of 1922 to discuss the

means that should be adopted for combating the disease and whether conditions should be attached to the exportation of hides, skins, and wool from countries where the disease exists. The committee will report to a further conference. In the meantime more active steps in this country are necessary.

The spore vaccine manufactured at the Veterinary Research Laboratory, Onderstepoort, is very effective and should be used extensively and regularly.

19. *Tsetse Fly.*—The life-history of species of this fly begun last year is being continued in Zululand. The work has a twofold object, one in relation to the disease known as nagana in live stock, and the other in connection with similar investigations instituted by the Imperial Bureau of Entomology in several parts of this continent, including Rhodesia, in its relation to sleeping-sickness in man.

20. *Nagana.*—Simultaneously with the study of tsetse fly by the Division of Entomology, the Division of Veterinary Education and Research is carrying out investigations in connection with nagana. Much progress has been made. Mr. Curson, the officer in charge, demonstrated that one of the remedies recommended, namely, tartar emetic, reduced mortality to a very low figure.

21. *Horse-sickness.*—The Director of Veterinary Education and Research is able to report very beneficial results from an improved method of inoculation, by which he reduced the mortality among horses treated at Onderstepoort to 2.5 per cent. The inoculation of 2413 mules was accompanied by a mortality of only about 1 per cent.

22. *Locusts.*—A full report on the work of the year appeared in the *Journal*, September, 1922. The infestation far exceeded anticipations both as regards extent and severity. The reports received by the Department, upon which a campaign is based and which are relied upon, were meagre, and consequently the provision made in advance proved inadequate on a few occasions in the beginning of the season. By the beginning of December, 1921, however, poison was manufactured in sufficient quantities to meet all applications promptly. It is regrettable that in many instances poison supplied free is wasted either by individuals using larger supplies than are necessary, or by application being made for larger quantities than the situation demands. This is a matter, however, over which the Department has no control, as it cannot take the responsibility of reducing applications and being accused of delaying or hampering destruction.

The much more extended campaign last season is indicated by the following comparison with the previous season:—

	1920–21.	1921–22.
Number of districts infested	32	58
Poison distributed (gallons) ...	12,990	92,675
Number of swarms destroyed ...	27,100	118,662

Large swarms of flying locusts spread over Bechuanaland and the western Transvaal districts from the Kalahari. A good deal of damage was done to crops, though many of these swarms were destroyed. Flying swarms laid eggs over a large extent of country beyond that upon which the campaign was waged last season.

Fortunately the destruction of "voetgangers" in the Cape and southern Orange Free State was so successful that probably a very large area in which destruction had to be undertaken last season will require little or no attention in the forthcoming season, for which adequate provision has been made.

With few exceptions farmers did valuable work. Many good suggestions also emanated from them for dealing with the pest. One of these is the formation of circles of farmers occupying a few farms with a view to co-operative destruction. This idea was strongly supported by the Department, and if acted upon by farmers with vigour should have most beneficial results, and should lead, incidentally, to great reduction in the expenditure now required for the employment of locust officers, who are appointed to ensure destruction by individual farmers.

The legislation on the subject of destruction of locusts was strengthened by Parliament last Session. Under the law as it was, a conviction for negligence was almost impossible.

Professor J. C. Faure, of the Transvaal University College, and a former member of the Division of Entomology, carried out a valuable study of the bionomics of locusts. The view had been held that the female locust laid only one pocket of eggs. He demonstrated that the same female laid several pockets at intervals, one female laying as many as twelve pockets with an aggregate of 428 eggs. The average number of pockets is 6 to 8. This fact emphasizes still more—if emphasis were needed—how great the ravages by locusts are if the utmost vigilance and diligence are not observed to prevent their reaching the flying stage.

23. *Citrus Canker.*—Satisfactory progress continues to be made by the Division of Botany with the eradication of this serious disease. Only four infected trees were found during the year, all on the farm Buffelspoort, Rustenburg District. During the previous year six infected trees were discovered on three farms, including Buffelspoort. The progress made is reflected by the following return of orchard trees found infected:—1917-18, 11,702; 1918-19, 920; 1919-20, 77; 1920-21, 6; 1921-22, 4. The utmost vigilance has to be continued to secure complete eradication. The expenditure on inspection staff amounts to about £7500 per annum.

24. *Wart Disease of Potatoes.*—This disease was unfortunately discovered in Natal and its origin has not yet been traced. So far the disease has been found on two adjoining farms in the Impendhle Division. The Department has been enforcing for years stringent regulations against the introduction of this serious disease, which is prevalent in several countries of Europe. Careful inspection was immediately instituted by the Division of Botany as to likely sources of infection, but without success. Careful watch is being kept over the principal markets of Natal for infected tubers. The infected properties have, of course, been quarantined and other necessary restrictive measures taken.

25. *Wool and Mohair.*—The wool and mohair slump of last year fortunately did not last long, and the scheme which the Government had introduced of guaranteeing advances by the banks was taken advantage of only to the extent of about £1250. Prices hardened after May, 1921, and continued considerably above pre-war levels.

The following table gives a comparison of the prices in recent years with those of 1914, as well as the quantities exported during the same years:—

Wool (grease)—Average price		1920	29·3d. per lb.
		1921	7·9d. per lb.
	May	1922	10·1d. per lb.
		1914	7·2d. per lb.

Quantity of wool (scoured and grease) exported	1921 ... 230½ million lb., valued at	£8,236,835
	1920 ... 119 million lb., valued at	£15,988,103
	1914 ... 133¾ million lb., valued at	£4,228,630

Mohair—Average price	1921	8·18d. per lb.
	1920	19·80d. per lb.
	1914	10·6d. per lb.

Quantity exported	1921 ... 17,128,000 lb., valued at	£583,643
	1920 ... 6,290,000 lb., valued at	£518,973
	1914 ... 18,865,743 lb., valued at	£834,202

Wool merchants confirm the Department's conviction that great improvement has been made in recent years in the quality of the wool clip. This is due both to the progressive spirit of breeders and to the sound educational work of the sheep and wool experts employed by the Department.

When it became known that the United States Government proposed to reimpose the 1909 tariff (withdrawn during the war) and thus levy an import duty of 15 cents per lb. on unwashed wool, the Union Government made representations showing the damaging effect on South African wool of basing a tariff on unwashed wool instead of clean yield, in view of the fact that South African wool yields only 38 per cent. of clean wool as against 48 per cent. obtained from Australian wool. The tariff of 1909 was, however, brought into operation again, but only as an emergency measure, designed, it would seem, to give immediate relief to the wool growers of the United States. The question raised by the Union Government was left over for later consideration. A permanent tariff has since been passed which makes provision on the lines urged by the Union Government.

Instances of false packing of wool continue to be brought to the Department's notice. It has been urged by purchasers that legislation should be passed to prevent such dishonest practice, which is carried on by a few, apparently with the intention to deceive the buyer. It would be very difficult, however, to frame suitable legislation for this purpose. Several associations have been formed this year for the proper sorting and marketing of wool, for the protection of the growers, and for securing the best prices according to quality. By

such organization more effective means could be applied by farmers for their own protection and for elimination of dishonesty than by Act of Parliament.

A serious statement has been made by an English firm that the quality of South African mohair has been steadily deteriorating. In order to test this statement, steps have been taken to submit a collection of the best mohair of the various types for transmission to the Trade Commissioner for purposes of comparison with Turkish mohair.

During the last Session of Parliament the law prohibiting the export of Angora goats was repealed. The prohibition was imposed seventeen years ago in the belief that the interests of South Africa were best served by preventing competition from other countries except Turkey which also had prohibited export of goats. It was believed, moreover, that South Africa had goats superior to any in the possession of the Turks, and that South African mohair could outstrip the Turkish article in quality. Mohair breeders have latterly come to the conclusion that restricted production, which could supply only a minimum number of mills, not only facilitated combination against producers, but prevented the establishment of the mohair industry in other large centres of population. The United States of America, for example, is also a producer of mohair, but to a very limited extent and of inferior quality. The encouragement of production in that country, it is believed, would create interests which would lead to a more extensive use of and a greater competition for mohair. A memorandum prepared by the Department of Overseas Trade of the United Kingdom shows that, owing to disturbances in the Ottoman Empire and particularly the slaughter of a large number of goats by belligerents in Anatolia, the supply of Turkish mohair has been much reduced, the present supply of Anatolian mohair having been brought down to one-third of its extent.

A scholarship was granted for the study of the requirements of the English mohair market and for a course of study at the Technical Textile College, Bradford.

26. *Export of Frieslands.*—At the instance of the South African Friesland Breeders' Association, assisted by the British Friesian Society and by negotiations between the Governments of the Union and the United Kingdom to overcome certain restrictions on the importation of cattle into the latter country, the first exportation of a shipment of pedigree cattle for sale in Europe took place in March. The sale by public auction was held in June, with highly satisfactory results to the sellers. The highest price obtained was for a cow which was sold for £4515. The highest price obtained for a bull was £4095. For the 91 animals sold the average price paid was £1337. The prices obtained must be regarded as exceptional, but at the same time the sale was gratifying proof of the high standard of excellence attained by Fries breeders in South Africa. In order to assist in the maintenance of this standard the limitation of future importation to animals of high milk-producing capacity is under consideration.

27. *Hides.*—In the *Agricultural Produce Grading Act*, 1922, provision is made, among other things, for the grading of hides. The Tanners' Federation of Great Britain, supported by tanners in this country, has made repeated representations regarding the bad flaying of hides and the depreciation of the value of hides by branding on the more valuable parts. Bad flaying obtains more especially

at the abattoirs. At the Johannesburg Municipal Abattoir the practice is in vogue of contracting for the supply of hides to dealers at per quantity for a period of months, with the result that no attention is paid to the quality of the hides turned out. The depreciation of South African hides by bad flaying and unwise branding is said to amount to anything up to 7s. per hide. At the Capetown Municipal Abattoir a "Perco" flaying machine has been installed, and it is understood that two similar machines will be provided in the near future at the Johannesburg Municipal Abattoir. This machine is a recent invention, and is said to do perfect flaying. Notwithstanding this, however, tanners urge that the grading of hides according to the manner in which they have been flayed should be introduced. It is, therefore, proposed to put the provisions of the Act mentioned into force in this respect.

The Cape, Orange Free State, and Transvaal Provinces have Brands Acts. In the first-named two, the choice of brand, and of the part of the animal to be branded, is left with the owner. In the Transvaal the owner can select one of a number of brands allotted to his district by the Government, but the law requires him to brand on the best part of the hide, while in the Cape and Orange Free State the best part is generally selected by the owner, because branding is facilitated and the brand shows up most clearly. In view, however, of the injury done to the hide, our branding system is in urgent need of revision and legislation to this effect is proposed.

It is calculated that the depreciation of hides by bad flaying and the present systems of branding entails an annual loss to farmers of about £180,000.

28. *Meat Export.*—The beef export trade had a serious set-back. While the number of cattle greatly increased, the export of beef dwindled to practically nothing. The following figures speak for themselves:—

	1918.	1920.	1921.
Number of cattle in the Union ...	6,851,924	7,655,072	8,557,089

an increase of 11 per cent. in the two years 1918-1920 and of 11 per cent. also in the one year 1920-1921.

EXPORT OF BEEF, 1916 TO 1921.

	Quarters.		Quarters.
1916	115,992	1919	285,367
1917	309,214	1920	69,885
1918	123,354	1921	13,326

The causes of this decline are threefold: the termination of the war, during which our export trade in meat came into being; unsuitability (as yet) of our meat for the English market; and collapse of the markets on the continent of Europe, for which our supplies are suitable.

The importation of frozen meat into the United Kingdom was in 1920 1,076,700 tons and in 1921 970,300 tons, as compared with 764,900 tons in 1913, while the prices between 1920 and 1921 declined from 140 per cent. to 23 per cent. above 1913 prices. In these circumstances the Continental markets received unusual attention from

exporting countries; the former, however, could import only 186,000 tons in 1921 against 300,000 in 1920. The exchange difficulty further complicated the situation.

Export has become an urgent necessity, in view of the rapid increase in the number of cattle. Moreover, large sums of money have been invested by exporting firms. A great combined effort is required to find an outlet for our surplus, but this cannot be done unless by some means our cattle can be placed on the European markets at world prices and therefore in competition with other countries. Conditions of farming in this country render such competition most difficult, because large numbers of cattle used for draught purposes and owned by natives are not available when they are of the age most suitable for marketing, while the comparative absence of feeding and recurring droughts are the cause of unstable prices, often in excess of world prices. The ultimate solution seems to lie in organization both of the trade side and of the producers' side and in education, with a view to reducing the cost of production, for instance, by the elimination of "scrub" bulls; by the breeding of heavier types of slaughter cattle to give greater weight for the same outlay; by feeding types which will pay for feeding, thereby making cattle available for slaughter throughout the year; and by better flaying of hides and branding of cattle to secure higher prices for hides.

29. *Butter.*—The production of butter in 1920-1921 was 18,963,073 lb. as compared with 17,809,287 lb. in 1919-1920. Since 1916 butter (including ships' stores) was exported to the following extent:—1916, 1,586,572 lb.; 1917, 3,111,821 lb.; 1918, 1,544,000 lb.; 1919, 512,588 lb.; 1920, 487,876 lb.; 1921, 2,698,201 lb. Since January, 1922, 1,273,054 lb. were exported. It is improbable that any further appreciable export will take place in 1922.

There have been great fluctuations in recent years as regards prices and production. Such variations are not in the interests of the industry. During the latter part of the war the Imperial Government purchased large quantities at remunerative prices. With the decontrol of butter by the Imperial Government trade conditions changed. The South African product had now to compete oversea with butter from other countries. In January, February, and March, 1922, unprecedently low prices were paid for butter-fat. Production in excess of local requirements necessitated export of the surplus, even at a loss. The events which followed are detailed by the Superintendent of Dairying. His remarks as to what is necessary to enable South Africa to compete in the oversea markets require careful attention by those immediately interested.

Regulations have been introduced for grading and inspection of export butter. These have worked smoothly and satisfactorily, and appear to be on the right lines.

30. *Cheese.*—Since 1916 the following exports (including ships' stores) have taken place:—1916, 36,088 lb.; 1917, 110,555 lb.; 1918, 487,872 lb.; 1919, 1,560,782 lb.; 1920, 314,301 lb.; 1921, 458,698 lb.

Cheese-making has developed satisfactorily, and cheese of high quality is being produced. At the same time the Superintendent of Dairying points out that far too great a percentage of indifferent cheese is still being made, owing to lack of experience.

The Department now has two cheese graders and instructors, one having been appointed recently. An improvement in the quality of our cheese should soon be apparent from the expert knowledge which has been placed at the disposal of manufacturers.

As in the case of butter, regulations for the grading and inspection of export cheese also were introduced.

31. *Pig Breeding.*—This industry is not receiving sufficient attention. The Department has not the staff for the purpose. Mr. C. Laver, assisted to a small extent by the Department as to travelling expenses, has been good enough to give his services free of charge for itinerant instruction; but it cannot be expected that Mr. Laver should longer continue to do so. The bacon factories have been making great strides in the quality of bacon produced, as has been proved by the prizes awarded for South African bacon at shows in Great Britain. It has been suggested by the factories that, in order to prevent unfair competition by inferior bacon, and to encourage the production of a high-class article, bacon for local consumption produced at factories should be graded. The latest returns of factory production show that in 1920-1921 the production amounted to 5,210,047 lb. Sixpence per 100 lb. live weight would produce sufficient under the *Agricultural Produce Grading Act*, 1922, to cover the cost of grading and leave a balance for providing itinerant instructors to give advice to farmers on breeding and feeding. Such a course would be of direct monetary advantage to both farmers and factories. Regulations on the subject will, it is hoped, be promulgated at an early date.

32. *Ostrich Feathers.*—This industry continues in a depressed state. Co-operation in the marketing of feathers and the provision of funds for an advertising campaign have been advanced from time to time as the only means of raising the industry out of its present unfortunate condition. Repeated efforts have so far resulted in failure to secure the co-operation of growers. A further effort is about to be made. The growing tendency to substitute private for public purchase does not appear to be to the advantage of ostrich farmers. Co-operation among ostrich farmers seems to be the only way to check or counteract private sales.

33. *Maize.*—The 1921 crop was a record one, the production being 13,347,237 bags, of which 4,628,197 bags were exported either in the form of maize or meal and similar maize products. The crop of 1922 is far below that of 1921, but the quantity produced will not be known until towards the end of the calendar year.

The elevator system which the Railways and Harbours Administration is providing will, it is understood, be available for at least part of the 1923 crop.

Before the war South African maize commanded higher prices oversea than Argentine maize, sometimes to the extent of 2s. for 480 lb. The Commissioner for Commerce on the Continent of Europe was asked to investigate why in recent years South African maize was sold at lower prices than Argentine maize. He reported that in the first place an American company bought up many important German starch factories, which produced the finest quality of maizena. Those factories which used South African maize on account of its superior quality now have to take their supplies from America In the second place, the steamship lines have introduced

bills of lading which enable them to discharge maize in practically any way they choose. Any extra charges involved in off-loading South African maize, which is carried in bags and not in bulk, have to be defrayed by importers. The charges so incurred in respect of South African maize amounts to 6s. 6d. per 2240 lb., as against 2s. 5d. in respect of River Plate shipments. When the elevator system enables South African maize to be carried in bulk, it should command at least as high a price as the Argentine product.

34. *Wheat and Oats.*—The season on the whole was not altogether favourable, drought being responsible for a shortfall in some of the principal producing districts in the winter-rainfall area, although in some cases the wheat crop equalled or exceeded that of the previous year. In the summer-rainfall area conditions were favourable in the Cape Province, but varied in the Transvaal, where, however, about the same quantity of wheat as last year is estimated to have been reaped. In the Orange Free State there was a falling off.

Production of Wheat and Oats, 1919 *to* 1921.

	Wheat. Bags.	Oats (Grain). Bags.
1919	1,538,720	999,580
1920	2,284,011	1,274,895
1921	2,158,000*	—

The wheat and flour imports consumed since 1917 are:—

	Bags† (200 lb.).	Value.
1918	458,261	£556,921
1919	449,044	598,890
1920	1,967,213	4,535,471
1921	428,585	607,998

The huge introduction in 1920 was due to over-importation and to a smaller production in 1919. A large quantity of this excess importation had to be carried over into 1921.

35. *Viticulture.*—The unfortunate boom in 1920, which was followed by a collapse of the wine market and the ruin of several firms, still leaves its effect. The wine market is depressed, the price paid for the last vintage for distilling wine being about £3 per leaguer. Of the estimated crop of 105,000 leaguers only 20,000 were sold to wine merchants.

The hopes built on a large export trade have not yet been realized. The exports in 1920 were 486,809 gallons, and in 1921 375,726 gallons, valued at £187,837 and £93,142 respectively. The growth of such a trade cannot, however, be expected to be anything but slow.

In view of all these conditions farmers turned their attention to the manufacture of raisins and dried grapes on a large scale. From 5d. to 7d. per lb. was offered in New York for the latter, and fairly remunerative prices ruled for raisins on the London market.

A co-operative society exists for disposing of the wine manufactured, and controls the disposal of practically the whole crop, and

* Crop estimate.

† Imports less re-exports: flour, 170 lb. = 200 lb. wheat.

it seems that no difficulty should be experienced in evolving a system which would give farmers a more or less stable market at remunerative prices.

The vintages at Groot Constantia Experiment Station in 1921 and 1922 were 15,542 and 13,010 gallons (about 129 gallons equal 1 leaguer); of the former vintage, 908 gallons were sold and 4910 distilled, while 2230 gallons of the 1922 vintage have been distilled, but as yet nothing has been sold. About 40 leaguers per annum are being matured, which it is hoped to sell oversea. This policy of maturing part of the crop, which was reinstituted in 1921, in addition to the depression in the wine market, accounted for the small quantity sold. A large block of vineyards at Groot Constantia, containing 31,000 non-paying vines, was uprooted and replanted.

The demand for table grape varieties of wine continues. The Viticultural Station at Paarl serves a very useful purpose by supplying large quantities of these varieties, the number of cuttings disposed of in the year being 5500.

Farmers are also giving more attention to the manufacture of moskonfyt (grape syrup), for which purpose a factory was established in the Caledon District. An oversea student in viticulture was instructed to proceed to Italy to make himself fully acquainted with Professor Monti's system of manufacture, which is said to be the best of its kind.

During the year 417 samples were purchased in terms of the Wine and Spirits Act for analysis in the following places:—

Cape.—Aberdeen, Alice, Butterworth, Barkly West, Capetown, Clanwilliam, Calvinia, Elliot, Fraserburg, Graaff-Reinet, Grahamstown, Hanover, Hermanus, Humansdorp, Knysna, Kimberley, Oudtshoorn, Phillipstown, Port Elizabeth, Prieska, Queenstown, Richmond, Sutherland, Tulbagh.

Orange Free State.—Bloemfontein, Bethulie, Boshof, Heilbron, Harrismith, Jacobsdal, Kroonstad, Philippolis, Vrede.

Transvaal.—Ermelo, Germiston, Johannesburg, Krugersdorp, Pietersburg, Pretoria.

Natal.—Vryheid, Camperdown, Richmond.

The following were the results of the analyses and subsequent prosecutions:—

Article.	Number of Samples Purchased.	Adulterated or Deficient.	Incorrectly Labelled.	Artificial or not Genuine.	Number of Prosecutions (by samples).	Number of Convictions (by samples).
Brandy	221	42	33	—	42	12
Whisky	107	10	18	—	10	4
Gin	64	8	8	—	9	1
Wine	8	—	—	—	—	—
Vinegar	17	9	—	—	9	3
TOTAL ...	417	69	59	—	70	20

In addition to the 417 samples purchased in the Union and referred to above, samples were analysed on importation, with the results shown hereunder:—

Article.	Number of Samples.	Adulterated or Deficient.	Incorrectly Labelled.	Artificial or not Genuine.	Refused Admission into the Union.
Brandy	20	3	7	—	3
Whisky	27	3	—	—	1
Gin	11	3	—	—	3
Wine	176	18	9	—	16
Rum	2	—	—	—	—
Vinegar	8	2	3	—	2
TOTAL	244	29	19	—	25

During the period under review 34 cases occurred in which the proprietors, when prosecuted, were discharged by the courts under section *thirty-three* of the Act on the plea that the adulteration had taken place without their knowledge. In several cases the barman admitted having adulterated the liquor without the knowledge of the proprietor, the latter being acquitted thereof under section *thirty-three* of the Act. The barmen concerned were immediately charged with the offence and duly convicted and fined.

36. *Fruit Industry.*—Two officers, who have specialized in citrus growing, were appointed to the Division of Horticulture. The rapid growth of the industry demands expert advice to farmers at this stage in particular; in fact, it would have been a great advantage if this need could have been met a few years ago when planting on a large scale commenced. The growth of citrus orchards is very rapid, as evidenced by the following Census returns:—

Number of Fruit Trees in 1919, 1920, *and* 1921 (30*th April*).

Discription.	1919.	1920.	1921.
Orange, grafted	887,470	954,840	1,371,675
Orange, seedling	359,440	327,670	439,375
Naartje, grafted	127,280	109,850	149,470
Naartje, seedling	165,490	213,450	226,610
Lemon	144,080	166,320	150,710

The oranges exported in the past two seasons 1920 and 1921 were: 1920, 123,051 boxes; 1921, 231,397 boxes.

As the report year ends in mid-season, the export for 1922 cannot be given yet. It is estimated, however, at over 20 per cent. in excess of 1921.

New export regulations came into force with the 1922 season. These were drafted in consultation with the Fruit Exchange, and made provision for a much stricter control of the quality of citrus fruit

offered for export. The regulations were not found suitable in several respects and will have to be reconsidered. The main object aimed at, however, namely, the prevention of the export of inferior fruit, was attained. Many growers suffered loss from lack of knowledge of the new requirements; not only were low prices realized for rejected fruit placed on the port market, but railage had to be borne needlessly. The question of inspection is bound up with proper packing facilities. While the present system obtains, by which each grower packs for himself, a larger quantity is likely to be rejected than if central packing could be instituted. If present conditions prevent central packing, the question of inspection at some centre inland may have to be resorted to to obviate the long railway journey in respect of rejected fruit.

The quantity of fresh deciduous fruit shipped in 1921-22, compared with 1920-21, amounted to: 1921-22, 816,289 boxes; 1920-21, 451,319 boxes.

The climatic conditions in the latter months of the season were unfavourable, severely affecting the keeping qualities of the grape crop.

It will be seen that, both in regard to citrus and deciduous fruit, there is a large increase in the export trade. Large progressive increases in the quantities available for export will take place in the next few years. Fortunately, the fruit growers have taken the wise step to form themselves into one organization, and they are, therefore, in a far better position than formerly, both to secure the necessary cold storage space on outgoing vessels and to purchase their requirements for the trade at lower rates.

A great advance was made in the exportation of dried fruit, as the following return indicates:—

Article.	1920.		1921.	
	lb.	£	lb.	£
Currants	4,964	381	4,600	261
Raisins	3,030,548	125,840	6,983,515	179,599
Prunes	55,787	3,807	80,950	3,132
All other dried fruit	314,230	23,076	224,780	8,771
TOTAL	3,405,529	153,104	7,293,845	191,763

Exports for 1922 already indicate a large increase over those for 1921.

In the latter year the regulations as to grading and inspection, which then came in force, could not be strictly applied, as they had to be introduced in mid-season, and neither farmers nor the trade had made adequate provision for meeting them. From the beginning of 1922 the regulations were enforced to the letter. This action, however, brought out some defects, judged from the point of view of trade requirements on the London market, notwithstanding that the regulations were framed at the request and upon the advice of exporters. These remarks apply more particularly to raisins. It would seem that there is a market for inferior as well as for high-class

raisins, so long as uniformity of quality is observed to enable buyers to know what they purchase. The regulations will be reviewed before the next export season begins.

The value of all fruit (fresh and dried) and of fruit products exported in 1920 and 1921 was respectively:—

	1920.	1921.
Fruit, fresh—		
Citrus	£93,251	£210,008
Deciduous	72,159	186,271
Other kinds	4,225	12,008
Nuts	2,309	3,144
Fruit, dried	153,104	191,763
Fruit juice and cordials	6,596	6,215
Fruit, bottled and tinned	23,126	46,812
Jams and jellies (including marmalade)	124,994	23,276
Total	£479,764	£679,497

37. *Tobacco.*—The 1920-21 crop was 16,620,640 lb., as against 11,644,300 lb. in the previous year. The Chief of the Tobacco and Cotton Division reports that the prices for the best grades remain fairly steady, but that the lower grades suffered a decline, attributable partly to the wet season during the collecting periods causing a large percentage of low-grade leaf, combined with the general financial depression and the temporary unsettlement of the market by the excise tax.

The technical staff was strengthened by the appointment of three officers, two of whom, however, filled vacancies caused by resignation.

A great deal of attention was given to the production of tobacco suitable for manufacture of nicotine. A large number of analyses made of South African-grown tobacco show that tobacco of high nicotine-content is procurable in South Africa, but to what extent cannot at present be stated. The officers in charge of the Tobacco Experiment Station at Rustenburg and at Elsenburg gave considerable attention to the cultivation of a wild tobacco known as *Nicotiana rustica.* This variety has an exceptionally high nicotine-content. They are continuing experiments and have induced a number of farmers to try this kind, as it is very probable that its cultivation will make the manufacture of nicotine in this country a profitable undertaking for export as well as for the local market.

38. *Cotton.*—The crop of lint for each of the years up to 1921 was:—

	Lb.		Lb.
1909-10	31,169	1916	227,562
1911	13,623	1917	243,885
1912	32,025	1918	283,128
1913	34,471	1919	764,584
1914	71,654	1920	1,094,763
1915	215,990	1921	1,169,298

This shows a progressive increase. The Chief of the Division of Tobacco and Cotton is of opinion that reports of a decline in yield in the United States of America will encourage development of the industry in South Africa. Prices continue favourable and show a satisfactory recovery from the low prices at the end of 1920 and beginning of 1921.

A Co-operative Cotton Growers' Exchange has been formed for the disposal of the whole crop to the best advantage. For this purpose the grading of cotton has been proposed, and is receiving consideration.

In the previous year's report the need for sufficient supplies of pure seed was mentioned, in view of the mixed quality of the cotton at present grown. Arrangements have, therefore, been made to extend the Tobacco and Cotton Experiment Station at Rustenburg by thirty acres. The need for the appointment of an additional technical officer for this station still remains, and until such an appointment is sanctioned, the work of supplying sufficient pure seed is retarded.

39. *Export of Eggs.*—The quantity exported in 1921 was 20,831,764 and in 1920 9,219,743, representing a value of £180,389 and £95,391 respectively. False packing by an exporting firm led to an inquiry by a committee, appointed by the Minister of Agriculture, into the control of the egg-export trade. The committee recommended the appointment of whole-time experts for inspection of eggs at the ports, in place of the present system of a poultry officer at Durban and a clerical officer under the poultry officer's supervision at Capetown. The committee also urged the appointment of a chief poultry officer. If a special inspection fee on export eggs is recommended by the organizations representing the poultry industry, and by this means the necessary funds are forthcoming, the proposals of the committee will be given effect to.

40. *Pest Remedies.*—Regulations were promulgated for the control of insecticides and fungicides, namely: stock dips, paris green, arsenate of lead, sulphur, copper-sulphate, and cyanide, the object being to ensure that farmers are supplied with remedies which are chemically pure and are of the standard which these purport to be.

41. *Agricultural Journal.*—Several improvements in the form and substance of the *Journal* have been introduced. This publication now compares favourably with any other of its kind. The monthly issue numbers 7400 copies in English and 2500 in Afrikaans. There are 2060 subscribers to the English and 310 to the Afrikaans issue. The cost of printing was £5912 and the revenue £2251.

In view of the free services rendered by crop correspondents in connection with the crop estimates, the *Journal* is issued to them free in return. This absorbs about 3500 copies.

42. *Grants to Agricultural Societies.*—At Union all such grants were undertaken by the Union Government, but the Financial Relations Act of 1913 made provision for grants to provincial bodies being made by those Provinces which elected to do so. The Cape

and Transvaal Provinces made provision accordingly, but the Union Government continued to give grants to societies in the Orange Free State and Natal. Owing to the serious fall in revenue, it was decided to discontinue from the 1st April last grants to the societies in these two Provinces, except the Central Society at Bloemfontein, whose grant is entrenched by Act of Parliament. It is understood that in the Transvaal also such grants are no longer made.

43. *Fertilizers Regulations.*—The systematic purchase and analysis of samples were arranged, and should establish beneficial protection to farmers by ensuring that fertilizers accord with the composition guaranteed. The arrangements only come into full effect after the period covered by this report, and will be reflected in that of the following year.

44. *Guano.*—The production in 1921 was 8500 tons, which is a large decrease on the record production of 10,445 tons in 1920. The unfavourable yield was due to very heavy rains during the breeding season.

A reserve of about 5000 tons had been built up to meet a possible short production. It was thought advisable to reduce this reserve so as to allow of a greater production of wheat, and the reserve was consequently reduced by about 1000 tons. The total quantity sold was 9423 tons in 1921 as against 8535 tons in 1920.

The price of wheat having fallen to 20s. to 22s. 6d. per bag, a low figure compared with the cost of production, which remained high, the Government decided to reduce the price from £10 to £8 per ton. Notwithstanding this reduction, the demand was less than that of the previous year; no doubt due to the reduced purchasing power of wheat growers in common with other sections of the farming community.

The main items of revenue for the last two years, ended 30th June, were:—

	1921-22.	1920-21.
Guano	£76,752	£91,556
Sealskins	19,710	23,812
Penguin eggs	3,892	3,728

The total receipts for the financial year 1921-22 were £115,817, and the expenditure £62,283.

Sealskins realized on an average 39s. 9½d. each, a very satisfactory price. The collection this year was the largest yet made, namely, 10,129.

45. *Brands.*—During the period 1st July, 1921, to 30th June, 1922, 1375 additional brands were registered in the Transvaal Province, 82 in the Cape, and 7 in the Orange Free State. 1362 branding irons were supplied by the Government contractor during the period stated.

The sum of £372 was collected for registration fees and £1280 for branding irons supplied at cost price.

The total number of brands registered in each Province to 30th June, 1922, was as follows:—Transvaal, 25,599; Orange Free State, 1618; Cape Province, 6,049; total, 33,266. No Brands Act is in operation in Natal.

Report No. I.

AGRICULTURAL EDUCATION.

Under-Secretary for Agriculture (Education):
E. J. MACMILLAN, B.S.A.

1. *General.*—Considerable progress was made in educational work during the year. The support obtained for the two years' course was well maintained; there was an increased demand for training by men who desired to fit themselves for settlement on the land at once. The attendance at the short vacation courses was larger than in the previous year. Special courses also were well attended.

Many new and important experiments were undertaken. While certain inquiries were concluded, many more were instituted and the volume of work tends to increase. There is a danger that with the multiplication of requests by the farming community for advice and assistance throughout the country, investigational work may fall behind. This would prove a fatal error, for instruction, whether in the classroom or on the veld, must be based on research.

The demands of the extension service have increased and will continue to grow. Officers whose duties lie at the institution may be able to give special assistance outside from time to time, but in the main, itinerant instruction must be carried out by those who can devote their whole time to the work; in other words, a special itinerant staff at each school will be necessary.

Important improvements were made at Elsenburg in providing electric light and a larger water supply. A complete water-borne sewage system is also under construction there. Apart from these works, little development was possible, and buildings and plant are urgently needed at several schools. The Grootfontein Institution is still housed in the old cantonment buildings of wood and iron built twenty years ago. Accommodation for staff is an urgent need at all schools. Many officers are now compelled to reside several miles from their work; best service is not obtainable under such conditions.

No progress was made in the establishment of a school for women which was proposed to be provided at Mariendahl, a portion of Elsenburg, funds not being available. Women are now admitted to short vacation courses only.

2. *Staff.*—The number of staff was the same as in the previous year as shown in the following statement:—

STAFF EMPLOYED AT 30TH JUNE, 1922.

Description.	Head Office.	Elsenburg.	Grootfontein.	Cedara.	Potchefstroom.	Glen.	Total.
Professional and Technical...	5	15	20	13	15	17	85
Administration and Clerical	4	5	6	4	6	4	29
Instructor and Assistants ...	—	13	14	8	13	9	57
TOTAL	9	33	40	25	34	30	171
Staff at 30th June, 1921 ...	8	34	40	28	31	30	171

There were also employed at training farms:—Beginsel, 5; Guba Park, 6. Additions to staff are required, especially for itinerant work, and as assistants to research officers.

3. *Scholarships and Bursaries.*—Ten new scholarships for study oversea were awarded during the year. The following figures show the position regarding scholarships to date:—

Scholarships or grants made	126
Number of returned scholars in Government employ	47
Number still engaged in study	43

Eleven returned scholars were appointed to posts in the Department. The number of assistance bursaries of £50 each, granted to needy students at Schools of Agriculture, was the same as last year (8). The value of the oversea scholarship is £200 per annum.

4. *Courses of Instruction.*—The attendance generally continued very satisfactory. All institutions were full since the beginning of the year with the exception of Glen School, and steps have been taken whereby special courses will be given there to the full accommodation. The numbers enrolled in the Diploma Course were not quite as large as those shown for last year, but the position in respect of the training of young men has changed but little. There was a strong demand for shorter periods of instruction and for practical training of older men who are anxious to take up farming with as little delay as possible. Many men, just arrived from oversea with the object of farming in the Union, applied and were enrolled. The training farms are at present unable to accept all applicants for this kind of work, and numbers are also being accommodated at the schools for practical and special courses. The facilities offered by the special sheep and wool course given at Grootfontein were extended to provide for a larger number of entrants, and 27 men were accepted instead of 15 the previous year. The interest shown was fully maintained, and the course promises to develop into one of the best of its kind given anywhere. It has indeed come to be recognized as an essential portion of the training required for all who wish to engage specially in sheep and wool work.

The special course in dairying at Glen, designed to equip men for the position of management in factory dairying, is filling a long-felt want. A change in the course will be made to permit students finishing in time to enter factories in October, when the manufacturing season begins.

There was a large increase in the attendance at winter vacation courses, which prove popular and must be considered as exercising a direct effect on current agricultural work. Development lies in the direction of special subject courses of one week's duration only. This appears to be the form of instruction most suitable to the majority of the public. Winter vacation courses were extended to Cedara also during the year. The short course in wine-making given at Elsenburg during the summer vacation was well attended.

At the training farms, the student is required to devote his energies to practical work, the period of training lasting one year. This affords opportunity for observation on the varying operations of the seasons and is the least time which can be recommended. Instruction in field work, dairying, poultry, and carpentry given

by the resident staff is supplemented with lectures in other subjects, such as live stock, veterinary science, and horticulture.

5. COURSES AND NUMBERS IN ATTENDANCE, 1921-22.

Description of Course.	Cedara.	Glen.	Elsenburg.	Grootfontein.	Potchefstroom.	Total.
Diploma Course	38	21	56	53	84	252
Special Course in Sheep and Wool	—	—	—	27	—	27
Special Course in Dairying ...	—	10	—	—	—	10
Practical Course	17	1	—	—	—	18
Other Special Courses	—	2	8	3	2	15
TOTAL	55	34	64	83	86	322
Winter Vacation Courses ...	59	116	79	163	125	542
Short Course—Wine-making ...	—	—	27	—	—	27
GRAND TOTAL ...	114	150	170	246	211	891

Numbers enrolled at Training Farms.—Beginsel (Standerton), 35; Guba Park (Indwe), 25.

The total number of persons who attended these courses during the year was 951; in 1920-21 there were 811, showing a considerable advance.

The diplomas and certificates awarded were as follows:—

Elsenburg: 23 diplomas, 2 certificates in agriculture.

Glen: 22 diplomas, 2 certificates in agriculture, 10 certificates in dairying.

Grootfontein: 16 diplomas, 14 certificates in sheep and wool course. Milk and cream testing certificates were issued to 7 persons.

Potchefstroom: 26 diplomas.

At Cedara the diploma course was reopened in January, 1921.

The students' inter-school judging competition was again held at the Bloemfontein Show. All five schools competed, with five men in each team. The classes judged were Friesland cattle, draught horses, and pigs. The team from Potchefstroom won first place, and the Glen team was second.

6. *Extension Work.*—Information is conveyed to farmers on many agricultural questions, chiefly by means of correspondence, through organized lectures, and by personal visits. The demand for assistance of this kind has grown, as the advice of itinerant officers has come to be more appreciated. Much can be done with the aid of correspondence, but the average man requires his difficulties to be investigated on the spot. This means the development of an extension service on a liberal scale. The figures for the past year show more work accomplished, principally in connection with sheep and poultry. In household science, too, more persons were reached. Three demonstrators were employed in this subject throughout the year. The strengthening of the Grootfontein and Glen staffs for sheep and wool, and arrangements for closer co-operation with the Sheep Division, made it possible greatly to increase the extension work in this subject.

The tables hereunder indicate that the poultry officers were able to show a greater volume of work done than those of any other branch. In horticulture, too, a very considerable interest is to be noted, indicative of the growth of the small holding system and the readiness of the public to take up the study on lines most appropriate to these conditions.

AGRICULTURAL EDUCATION: EXTENSION WORK DONE DURING 1921-22.

Subject.	Inquiries dealt with.	Lectures and Demonstrations.	Attendance.	Number of Shows Attended.	Visits to Farms, Poultry Yards, etc.
Agriculture and Stock	7,687	166	8,319	135	767
Agricultural Chemistry ...	1,573	20	818	7	91
" Botany	478	7	390	7	32
" Engineering ...	944	2	40	4	31
Entomology	534	8	500	6	47
Veterinary Science	280	5	170	4	150
Dairying	106	5	160	8	10
Poultry	3,767	194	14,502	71	413
Horticulture	988	90	1,973	19	133
Household Science	492	109	7,534	37	6
Total for year 1921–22 ...	16,849	606	34,406	298	1,680
Total for year 1920–21 ...	13,791	416	27,528	293	1,801

Engagements filled in judging at shows numbered 262, a large increase over the previous year, and many important and beneficial conferences were held at the different schools. At Elsenburg there were three such meetings, viz., the Annual Grain Farmers' Conference, the Cape Dairymen's Association, and the Tobacco Growers. All three were well attended. Lectures were delivered by the staff, and features of work of interest in each instance were inspected. A Dairy Farmers' Conference was held at Cedara in April. About 250 persons were present. The Annual Poultry Conference at Cedara, in May, drew an attendance of 400 and was very successful. At Glen a largely attended Poultry Conference was held. The Annual Maize Growers' Conference took place at Potchefstroom in April. The Boys' Maize Growing Competition was conducted from Potchefstroom for the seventh year; twenty-five schools competed and a very satisfactory interest was shown in the work.

Live stock were entered for competition at the leading shows, and exhibits of an educational character representing the results of experimental work were staged at as many centres as possible.

Assistance was rendered to various breed societies in the inspection of cattle for the appendix section of the stud book, 19 herds being examined. Members of the Grootfontein staff inspected 67 flocks of merino sheep for stud-book and grading purposes. Two agricultural surveys of proposed railway routes were carried on by the Principal of Grootfontein and reports made to the Railway Administration.

The analysis of materials, testing of seeds, determination of fat in milk and cream, and similar services, were carried out for the

farming public at nominal fees. The inspection of dairy glassware continued to demand considerable attention from the Chemistry Sections.

7. *Publications.*—Many articles were contributed to the *Journal* of the Department, and subjects dealt with in a technical manner were furnished for separate publication. A great deal of information on different agricultural subjects was given through the agricultural Press.

FINANCIAL STATEMENT OF THE SCHOOLS OF AGRICULTURE AND EXPERIMENT STATIONS FOR THE YEAR ENDED 31ST MARCH, 1922.

Name of Institution.	Receipts.*	Expenditure.*	Net Cost per Student for Maintenance and Education.
	£	£	£ s. d.
Cedara	8,227	20,810	108 10 7
Elsenburg	13,648	32,663	105 4 11
Glen	6,798	24,742	138 3 0
Grootfontein	12,529	41,614	156 5 5
Potchefstroom	9,648	28,818	104 3 6
TOTAL	50,850	148,647	122 13 6†

EXTRACTS FROM PRINCIPALS' REPORTS.

8. CEDARA: *J. Fisher, B.Sc., N.D.A., Principal.*

Agricultural Conditions.—Agricultural produce, including live stock, has, similarly with other commodities, passed through a very great depression. This was felt not only by the dairy farmer and maize grower, but also by the sugar planters, and those feeding stock. The fall in the price of maize and the low worth of milk gave a decided impetus to the production of pork. Conditions with regard to surplus oxen are far from satisfactory. Prices for oxen are so low that the farmer will not sell; farms are becoming overstocked.

Fresh farms are being taken up by settlers in increasing numbers: a very hopeful sign.

A pressing problem is that of markets for various kinds of the farmer's produce; and more than ever is it necessary for the farmer to know what his costs of production are.

Experiment and Research.—The Experiment Station at Winklespruit was closed at the end of 1921.

The sugar industry in Natal is dependent upon one variety of sugar-cane: the Uba variety. The need is urgent for new varieties, new selections, cross-breeding, and selection with the object of maintaining vigour and drought-resistant qualities, but lowering fibre and increasing the sucrose content.

A comprehensive study was made of the diseases of cutworms. Many species of insect parasites were reared. A new fungous disease

* Including value of free issues and transfers.
† Average for the five Institutions.

of the wattle bag-worm was discovered and studied; it proved the importance of wilt diseases. Investigations in regard to wattle bark and other South African tanning materials were continued. The oxidation of arsenical dips in dipping tanks received much attention. The extent of the oxidation was found to be much greater in tanks stocked with proprietary dips than with the plain arsenite of soda dip, only explained by the presence of coal-tar derivatives in the proprietary dip used. Another important test made was that of investigating the reversion of water soluble phosphates in dolerite soils. Three new fungous diseases were found on beans and cowpeas. Seed selection of maize and tuber selection of potatoes were carried out. Among crop experiments the maize manuring trials demonstrated the value of phosphates in the more soluble forms. Inoculation experiments with leguminous crops yielded interesting results and indigenous clovers were considerably developed. Variety trials were carried out principally with grasses, beans, and potatoes.

A world's record for Rhode Island Red Single Comb was established during the egg-laying competition that finished in March, 1922. A pen of four hens produced 904 eggs in 48 weeks; 868 eggs were 2 oz. and over, giving an average of 266 eggs per bird.

A disastrous hailstorm on the 17th March, 1921, resulted in early defoliation, bruised bark and destroyed fruit buds, and a light fruit crop in 1922. Fruit-fly was very much in evidence, and to combat this, blackberries were eradicated from the orchard and worthless varieties of other fruits eliminated. Woolly aphis was very prevalent, and three attempts to introduce the parasite secured from the United States of America were successful.

The Farm.—Weather conditions had an unfavourable effect upon yields in this area. Later sown teff crops failed altogether. The season at Cedara, however, was above the average. Whilst the oat-hay crop was harvested with difficulty, and the potato crop did not turn out too satisfactorily, other crops did well. In Algerian oats, from 100 acres, 2 tons per acre were secured in fairly good condition, while 9 acres were grazed off in spring by test cows. Maize grain yielded 1000 bags from 140 acres: a good return. Maize, silage, about 75 acres, yielded poorly owing to a dry autumn. One silo was filled; approximately 200 tons of excellent silage were made. Other crops sown were:—Teff, potatoes, soya beans, linseed, swedes, turnips, rape, Japanese millet, and artichokes.

There appears to be a demand for the medium heavy type of horse for farm work, such as maize planting, mowing, etc., and this is a promising sign.

The number of cattle at 30th June, 1922, was:—Frieslands, 43; Ayrshires, 29; Shorthorns, 55; and Aberdeen-Angus, 73—total, 200. The total yield of milk for the year was 19,402 gallons and was below that of last year.

During the year the chief ailment of cattle was gall-sickness. All animals suffering from this have recovered, save one young Aberdeen-Angus bull.

The contagious abortion cows were transferred to Onderstepoort for research purposes. Three animals which gave positive reactions were maintained on account of their high individual merit. There have been no fresh cases during the year, which points to the fact that any infection is now confined to the isolated camps.

The entire herd has remained free from tuberculosis for several years now. All cattle are tested yearly.

The stock sale on 24th June was not up to expectations. The slump in cattle and the poor attendance seem to have been the factors responsible for the low prices.

9. ELSENBURG: *W. A. K. Morkel, M.Sc., Acting Principal.*

Agricultural Conditions.—Everything considered, climatic conditions were exceedingly unfavourable for the profitable production of all cereal crops, but for the growth of summer crops they were most favourable. Owing to the poor returns in all cereal crops, farm commodities did not change much in price. Milk was a regular glut in the market throughout the spring and early summer, and in consequence the prices realized for dairy stock were not more than average. Owing to the large surplus the market value of wine was in many cases below the actual cost of production. For wheat and other cereals, prices were barely above the cost of production.

Extension and other Work.—The amount of extension work exceeded that of the previous year; this service has been expanded so much that the Institution cannot possibly meet the demands made upon it.

The analysis of materials reached a large volume, principally soils, wines, water and fertilizers, milk-testing, and the germination of seeds.

At Mariendahl extensive experiments and inquiries in the nature of research are in progress in the various sections. Many have been running for several years, and a number of important new experiments have been undertaken.

A comprehensive series of experiments in the cross-breeding of pigs and feeding for the production of bacon was completed.

Much experience was gained in methods for the control of codling-moth.

The Farm.—The total area under cultivation was (*a*) winter crops, i.e. grain, hay, grazing crops, 393 acres; (*b*) summer crops, i.e. silage, grazing, soiling, and vegetable crops, 173 acres. The principal crops grown were oats, wheat, rye, vetches, maize for silage purposes, and rape. In addition, sweet sorghums, Sudan grass, barley, kale, sweet potatoes, kaffir melons, mangolds, and sunflowers for silage purposes, were also grown.

All sheep, excepting the merinos, made satisfactory progress. Attention has already been directed to the inadvisability of keeping merino sheep in this area, and as a result a considerable number were disposed of at our annual sale and also culled. The pure-bred Suffolk Down flock again proved to be very successful, and an excellent lamb crop was obtained.

Both the Friesland and Jersey herds made steady progress. A new Jersey herd-leader, "Inkerman Cid," son of the world-famous "Cid," was imported from England in August, 1921. His first crop of calves have just been dropped and give every promise of proving highly satisfactory. This Institution is the possessor of the first Jersey cow in the Union to qualify for the advanced registry, and also the record (official) butter-fat production Jersey cows. Over 75 per cent. of Friesland cows have qualified for admittance to the advanced registry.

The annual sale of live stock was held in October, 1921, the prices obtained for all classes of stock being a record for this Institution. The gross receipts amounted to £2364.

Development.—Among other works the following were carried out:—(1) Four acres were sown to cluster pine. The germination of the seed was good and the growth of the trees satisfactory. (2) Ten thousand sugar-gums and pine trees were planted on different parts of the farm. (3) The small plantation of 2000 sugar-gums planted on the Klapmuts boundary of the farm made remarkably good growth. (4) A borehole 160 feet deep was sunk and is yielding between 6000 to 8000 gallons of water per day. (5) 942 fruit trees were established during the year. These consisted of almonds 80, apricots 299, peaches 406, prunes 157; varieties of fruit specially suited for drying purposes were planted.

Mariendahl Farm.—The total area under cultivation was (*a*) winter crops (grain, hay, and grazing crops), 200 acres; (*b*) summer crops (silage, grazing, and soiling crops), 65 acres. The standard of the grade herd of Friesland cattle was considerably improved by the continued use of young pure-bred Friesland sires from Elsenburg. The herd at the 30th June, 1922, consisted of 40 cows, 20 heifers, and 42 calves.

The young pear orchard gave remarkably good returns, the bulk of the fruit being handled at Elsenburg. The returns from the vineyard were also satisfactory, most of the crop being converted into raisins. Between 500 and 600 fruit trees were planted. A borehole was sunk to the depth of 145 feet, the casing being driven into solid granite rock. The daily yield from this supply of water is estimated at 30,000 gallons.

10. GLEN: *M. J. Joubert, B.S.A., Principal.*

Agricultural Conditions.—The depression continued throughout the year. The price for horses remained practically stationary. There was a slight advance in cattle prices. The price of wool improved considerably, but very few farmers benefited, as the majority of clips were sold before the advance took place. If prices can be obtained for the next clip equal to present prices, many farmers will be saved. Heavy losses were sustained and considerable expense entailed owing to severe drought during the latter half of the summer, followed by an extremely cold winter. It is feared that a large percentage of this year's lambing crop has been lost.

Increased attention was given to pig-breeding.

Many requests are made for assistance in grading up herds, and queries received regarding grading, feeding, etc.; unfortunately, the Institution is not in a position to meet all requirements.

The need for more extension work in the economic production of live stock crops is urgent and cannot be delayed much longer.

The organization of farmers on the whole has retrogressed in the Orange Free State. Occasionally there is a revival, but it is only of short duration. The weakness is the lack of system. Until a general plan of organization is formulated for all farming pursuits this difficulty is bound to occur. Co-operative societies have done a great deal of good. The membership of some has remained practically stationary for the last six or eight years. This shows

that all farmers who have realized the value of co-operative societies have joined. Further progress will be slow unless farmers can be organized in special or general associations and active propaganda work is undertaken in educating them to realize the value of co-operation.

Experiment and Research.—Trials are in progress with field crops, both under irrigation and on dry lands. This work is still in its initial stages. A considerable volume of analytical work was handled, and investigations were carried out in regard to certain soils. A study was also made of the wild rodents connected with the spread of plague.

Domestic science was confined almost exclusively to problems connected with farm life, such as canning of vegetables and fruit, soap-making, etc. This kind of work is not undertaken to any extent by household science teachers, and there is an unlimited field for investigation.

The Farm.—The rainfall for the year ended 30th June was 17.24 inches. The water storage requires to be considerably augmented to meet the requirements of the farm. Practically all the crops partially failed owing to lack of water. As the majority of crops were put in early an average hay and ensilage crop was obtained.

The total area under cultivation, not including the orchard, deciduous trees, vegetable garden, and permanent crops, was 416 acres.

The following main crops were grown:—Oats, rye, teff, Sudan, maize (silage).

The water in the river was exhausted early in the winter, and the oats and rye crops were grazed off in consequence.

The annual sale of stock realized £1075. Only a limited number of stock was offered for sale. Considering the depression which prevailed throughout the Union the prices were satisfactory.

The numbers of pure-bred stock maintained at the Institution as at 30th June, 1922, were:—Horses, Percheron and Clydesdale, 21; donkeys, Catalonian, 15; cattle, Friesland, 68; South Devon, 42; Africander, 19; pigs, Large Black, 25; sheep, Wanganella, 179. Most of the horses are Percheron. A small stud of donkeys is kept.

The Friesland herd is continuing to attract attention owing to its capacity for yielding milk. When the animals it is proposed to sell this year are disposed of, all the cows in the herd will be eligible for the "Advanced Registry." Considerable attention is being paid to the improvement of the Wanganella Stud. Now that a lecturer is stationed at the Institution the stud can receive the attention it deserves.

Development.—Improvements carried out included the completion of science fittings for the school, erection of an incubator house, supply of new pump and power churn, 6600 yards of farm fencing, and 22 new poultry runs.

11. GROOTFONTEIN: *R. W. Thornton, Principal.*

Agricultural Conditions.—The several branches of farming practised in this area suffered from the prevailing depression, but there are signs of improvement. There is one good sign everywhere, the desire of the farmer to organize, and it is felt that if he can be

given the correct lead in (*a*) the economics of production, and (*b*) the conditions of marketing, things will be much improved. An active campaign in the economics of production in the school and by extension work amongst the farmers will do far more good at the present time than other class of work.

Angora goat farming is just emerging from the blackest stage in its history, but assistance is required to establish it permanently. The same remarks apply to ostrich farming, but in a less degree, as Grootfontein possesses the nucleus of a staff to assist the farmers in this direction. Considerable progress has been made during the past year in sheep farming. In regard to cattle, conditions have also improved in the system adopted, but the collapse of the meat market is a serious set-back and it is feared will affect the progress towards improved feeding. A very large number of silos came into use during the year, and the silage campaign conducted from this Institution is bearing good fruit.

Extension Work.—Every effort was made to release members of the staff from routine duties to enable them to prosecute work throughout the area, and compared with previous years considerable progress was made. Greater improvement is anticipated as a result of a further rearrangement of the curriculum which has now been completed.

Experiment and Research.—Extensive tests were conducted with winter cereals, including 350 varieties. The wheat cross-breeding experiments were continued and several promising crosses raised. Selection trials in maize and grasses were among other important experiments in field crops. Provision was made for co-operative trials by farmers, but the bulk of these could not be carried out owing to drought. The experimentalist for the South Coast reported a variety of wheat (known as "Great Scott") which for four years has proved to be proof against rust in an area where the latter has been very prevalent, and steps were taken to test it extensively throughout the Union.

An important irrigation experiment was laid down with the object of obtaining reliable data as to the minimum and maximum supplies of water to be used for various crops under Karroo conditions. This will be a very comprehensive test extending over a number of years. Considerable attention was given to potatoes, including trials of varieties, storage of seed, and selection of seed from different areas.

Observations were undertaken concerning the problem of veld-grazing and the effect of different methods of veld treatment on the stock carrying capacity. Investigations regarding the control of the "Blow-fly" pest are in progress.

The principal lines of research in chemistry were studies in soils of the Karroo, fertilizers, and sugar-beet contents. Important trials were carried out and results published in regard to the use of prickly-pear as a feed for different classes of stock.

The Karakul breeding experiments were continued and important investigations commenced with the merino, including the relation of kemp as a breeding character, the effect of altitude, and grazing problems. The breeding experiments with ostriches are progressing favourably, and crosses with the North African birds promise to yield valuable results. Various feeding experiments with poultry for egg production were carried on. The production of vegetable

seeds, the best times for seeding and practical means of minimizing the macrosporium disease of tomatoes, were studied.

An area of approximately 500 acres was recently acquired adjoining the village of Bathurst, and a large number of wheat varieties and selections have been sown.

The Farm.—In general the season was not very satisfactory for crops. The acreage dealt with was as follows:—Sudan grass, 60; pumpkins, 4; potatoes, 8; oats, 34; lucerne, 140; silage, 25; salt bush, 13; vegetables, 2; orchard, 12; experiments, prickly-pear, 40; fallow land, 130—total, 468 acres.

The Percheron breed of horses is kept and numbers 22. A small stud of Catalonian donkeys has been maintained. Two pure-bred herds of cattle are now kept, Friesland and Shorthorn. There are on the farm upwards of 200 head of breeding cattle, and approximately 3000 sheep (including Merino stud sheep), Karakuls, Merino flock and slaughter flocks of Persians, and cross-breds. There are about 160 Angora goats, and of ostriches 20 breeding birds and 100 head of young stock.

The annual sale of stud stock on the 16th September, 1921, realized £1908.

Development.—The principal work was on a large storage dam in the vlei, which was constructed under the direction of the Irrigation Department; the installation of an electrical plant to pump water for domestic purposes; a shed for the Angora goats was rebuilt; and the erection of a small milk-room at the dairy stable. The irrigation dam for experiments was enlarged to a capacity of about 750,000 gallons, and a system of concrete water channels was constructed. A considerable extent of new fencing was erected.

12. POTCHEFSTROOM: *T. G. W. Reinecke, B.A., M.Sc.Ag., Principal.*

Agricultural Conditions.—There was a considerable shrinkage in the maize crop of the season 1921-22, especially in the western Transvaal, owing to drought and locusts, and also in the eastern high veld due to stalk-borer. Poor prices ruled for maize, so that many growers who are solely grain farmers were and still are in serious financial difficulties.

The year was a good one for live stock. Unfortunately, prices for live stock declined considerably owing to the depression, those for pigs being most discouraging to growers. It seems that here also co-operation is necessary to stabilize the market. At present sufficient discrimination is not made by buyers between the kaffir type of pig and the well-bred, properly fed baconer.

The market for slaughter sheep and merino wool hardened considerably in the season of 1921-22, and good prices have been maintained throughout, but dairy farmers had a bad time during the year.

An endeavour was made by this Institution during 1921 to induce maize growers in the western Transvaal to extend their operations to peanut-growing. At the time of writing, growers of this crop are receiving very fair returns for it.

Experiment and Research.—The cross-breeding experiments with the Suffolk ram on pure or cross-bred Suffolk-Persians again furnished interesting and instructive results. The cross-bred ewes are proving excellent mothers, and in nearly all cases have reared twins. The

percentage of lambs has been high. The lambs mature at an early stage, prove very hardy, and keep in excellent condition all the year through.

Studies concerning the nitrification of soils were continued and much important work done in connection with tobacco soils in the Rustenburg District. The lime requirements of soils were also investigated. A number of entomological experiments were completed, including the control of grain-eating birds and methods of destroying rats and other vermin. The research work on charcoals made from exotic timbers grown in the Union was completed and the results published. Some promising botanical studies are in progress, including the vitality of maize seed, potato diseases, seed degeneration, rust in cereals, and general breeding work in wheat.

The crop experiments were extensive—some 30 different experiments being conducted in this section, variety and fertilizer trials predominating.

The Farm.—The season was unsatisfactory in several respects. Altogether 867 acres were steam-ploughed and ploughed with oxen, including 74 acres at Brakspruit; 267 acres were manured with Government guano, 297 acres with superphosphate, 1002 acres were irrigated, and 1476 acres were cultivated. Owing to drought, several crops were complete failures, and in most cases the ground was reploughed and other crops sown. The ground prepared and planted to the different farm crops during the year was 500 acres in extent. In addition, 50 acres, which form the experimental plots, were under plot tests. There were 224 acres under maize of the Chester County and Potchefstroom Pearl varieties. The former and portion of the latter gave a good yield of grain. Both the silos were filled and a quantity of green maize which failed was fed to the dairy cows. About 50 per cent. of the whole crop was blank; stalks growing to over 6 feet in height failed to produce cobs. This was general throughout the district.

Good progress was made during the year with the different breeds of live stock. Except in the case of horses the natural increase was satisfactory. Five herds of pure-bred cattle were maintained, also a herd of cross-bred cattle used for experimental purposes.

Totals of the different herds on hand at 30th June, 1922, were as follows:—

Friesland, 70; Ayrshire, 51; Hereford, 71; Sussex, 75; Africander, 64; Hereford-Africander, 18; Sussex-Africander, 20; other crossbreds and oxen, 78—total, 447. There were also 75 pigs on hand.

The year was a particularly good one for sheep. The lambing season was a record one, 115 ewes giving 110 lambs, an average of 95 per cent. As in former years it was difficult to get the Romney sheep to breed at a season suited to this district.

The annual sale of pure-bred stock was held on the 7th September, 1921, and considering the adverse conditions then prevailing, the result was satisfactory. The total amount realized was £2054.

Development.—A portion of the farm Noydjons, some 1000 acres in extent, was acquired from the Lands Department for grazing purposes, and several miles of new fencing erected. Approximately 200 acres of the school farm were enclosed with dog-proof fencing. Electric light was installed in several of the staff residences and in the educational block.

Report No. II.

VETERINARY DIVISION.

Principal Veterinary Officer: J. D. BORTHWICK, M.R.C.V.S.

1. GENERAL.

THE position with regard to the eradication of certain contagious animal diseases in the Union cannot be regarded as altogether satisfactory: this is largely, if not wholly, due to the inadequate field staff at the disposal of the Division. Much of the blame for the slow progress made in the eradication of East Coast fever undoubtedly rests with the stock farmer, and until it is more or less generally realized that the Government regulations are primarily a protection to the stock farmer, progress will continue to be slow. On the other hand, if every stock owner in the Union were imbued with sufficient public spirit to regard himself as a potential administrator of the stock diseases regulations, there is little doubt that contagious diseases would very soon be under control. Meanwhile, we have to face the fact that many stock owners regard the regulations as both irksome and, to a large extent at any rate, unnecessary, and such being the case there is only one alternative, and that is to increase the field staff of the Division, thereby increasing the supervision of dipping operations and so forth. While expenditure of public funds must be rigorously controlled, economy can be carried too far: if a more strenuous compaign were adopted for a few years it would do much towards cleaning up animal diseases throughout the country. Even if the veterinary field staff were doubled for a brief period, the results would warrant the extra expenditure. Such a policy would be economical in the end; the disease would be confined within limited bounds, and, as a result, the supervision could be relaxed to a certain extent over a large portion of the area at present needing supervision, and the efforts of the staff concentrated in the areas still infected. Both in the Transkeian Territories and Natal, the field staff was increased during the year, in the latter province by 20 full and part time dipping inspectors and, in the Territories, by the addition of four inspectors and the creation of posts for six senior inspectors to control certain districts, for which six of the most experienced inspectors on the staff of the Division were selected. The Division is, however, still under-staffed and, until more supervision is provided for dipping operations, satisfactory progress in the eradication of East Coast fever will not be made, more especially in Natal.

2. EAST COAST FEVER.

Cape.—In March, 1922, an outbreak of East Coast fever was discovered at Komgha, in the Cape Province. The position is

considered to be very satisfactory,* so much so indeed that it was considered perfectly safe to reopen the district to ox transport. A block of 13 farms was quarantined; within this area the dipping interval was shortened from 7 to 5 days and handdressing was also ordered. The source of this outbreak has not yet been discovered, but seeing that several locations in the Transkei bordering on the Komgha District were at the time actively infected with East Coast fever, it is highly probable that that was the source of infection.

Transvaal.—There are nine districts in which East Coast fever exists, as compared with six at the end of June, 1921. (1) *Lydenburg.*—In this district there is only one infected farm, two having been released from quarantine during the year, and no fresh outbreaks have occurred. At Elandsdrift No. 41, twelve deaths occurred, with 28 last year. The last death occurred in March, 1922, and there is every reason for believing that the disease is now under control, and no further deaths are expected. (2) *Piet Retief.*—There were 12 infected farms in this district at the end of June, 1922, as compared with 13 the previous year. While no less than 12 farms became clean during the period under review, 11 fresh outbreaks have recently occurred, a serious setback. The infection would appear to have been introduced from Swaziland on the one side and from Natal on the other. The disease was first discovered on the farm Hebron No. 185, and it was proved that cattle from the farm in question were allowed to stray into Swaziland shortly before the disease broke out on this farm. Six further farms adjoining the Swaziland border subsequently became infected, and the disease was, unfortunately, conveyed by means of transport oxen from one or other of these farms to the Piet Retief Town Lands, where a single death only occurred. Further outbreaks occurred on the farms Zendelingspost No. 145 and Bakenkop No. 121, on the Natal border. While the mortality on the majority of the newly infected farms cannot be regarded as serious, the reintroduction of the disease into this district is most disappointing, and had it not occurred, only one farm would have been remaining in quarantine at the end of the year. In this district 125 deaths from East Coast fever have occurred and 3416 head remain in-contact. (3) *Pietersburg.*—Excellent progress in the eradication of disease was made, and only 6 farms remain infected as against 14 at the end of last year, and of the 6 infected farms 3 will become clean in July and August by lapse of time since the last death. The only fresh outbreaks occurred in January and February, 1922, on the farms Middagzon No. 926 and Nooitgedacht No. 56 respectively, where only one death occurred. The total number of deaths in this district from East Coast fever amounted to only 5 head, and 6000 animals remain in-contact. (4) *Barberton.*—Excellent progress was also made in this district, as disclosed by the fact that only 3 farms remain in quarantine as compared with 16 at the end of the previous year. One fresh outbreak occurred, however, on the farm Rozentuin, situated near the border of the Carolina District. The source of infection has not yet been discovered, but as the farm is in an isolated part of the district there is little doubt that the outbreak

* Up to August, 1922, only one animal is known to have died of the disease out of a total of 1282 in-contacts.

resulted from an illegal movement from some infected area. Out of 909 in-contacts, 92 deaths occurred. (5) *Zoutpansberg.*—The number of infected farms and native locations in this area total 24, as compared with 45 at the end of June, 1921; 32 farms became clean during the year, while 11 fresh outbreaks occurred, all of which, with one exception, were in the Sibasa area and were extensions of infection from pre-existing infected areas. The total number of deaths from East Coast fever in this district was 1977, and 21,017 head remain in-contact. (6) *Pretoria.*—On the 30th June, 1921, there were 87 infected farms in this district. During the year 35 fresh outbreaks occurred, while 29 farms became clean, leaving a total of 93 farms still infected. Practically all the fresh outbreaks were the result of the spread of disease from infected to buffer farms, and comparatively few deaths occurred in the case of these fresh outbreaks. Dipping was only commenced on a number of infected farms in the Bush Veld towards the end of 1921, and, in view of all the circumstances, the percentage of deaths was surprisingly small and may be taken as an indication that, generally speaking, dipping operations had proved most effective. The area south of the Pretoria-Middelburg railway line is now rapidly becoming clean. There is every reason to believe that if the present system of supervision and control is maintained the great majority of infected farms in the Pretoria District should be out of quarantine within twelve months. The deaths recorded number 750, and 24,015 head remain in-contact. The position in this district cannot be regarded as other than satisfactory. (7) *Carolina.*—There was no East Coast fever in this district at the end of June, 1921, but outbreaks occurred on the farms Zoekmy and Kleintheespruit during April, 1922. It has not been definitely ascertained how the disease came to be introduced into this district, but an illegal movement of cattle was doubtless responsible, either from the Barberton District or from Swaziland. Provided the erection of dipping tanks on the surrounding farms can be expedited, no great difficulty is anticipated in controlling the disease. Out of a total of approximately 600 animals in-contact, 82 deaths from East Coast fever have occurred. (8) *Waterberg.*—This is another district to which the disease spread during the month of March, 1922, an outbreak occurring in the Landsberghoek native location, which also involved the farms Hartebeestfontein No. 1520 and Bloemhof No. 1672, and subesquently spread to the adjoining farm Driefontein No. 1547 during the month of May, 1922. The most disconcerting feature in regard to this fresh infection is the fact that the farms concerned are about 80 miles distant from the nearest known source of infection, and no light has yet (August, 1922) been thrown on the source of infection, despite all efforts made by the police and the officers of this Division. The deaths recorded total 37, and 1825 animals remain in-contact. (9) *Middelburg.*—In the Witbank subdivision of this district the disease made its appearance in February, 1922, on the farm Kranspoort No. 18. The source of the outbreak has, unfortunately, not been traced, but as the main road leading out of the infected portion of the Pretoria District traverses the farms concerned, there is little doubt that an illegal movement over this road took place.

Natal.—The position in Natal improved appreciably during the year, although in some districts there were fresh outbreaks in clean

areas in which dipping operations were not supervised but left to stock owners themselves. In Umvoti and Estcourt veterinary areas, the two worst infected areas last year, much headway was made, but on the other hand setbacks were experienced in Vryheid, Paulpietersburg, Babanango, Utrecht, Ixopo, Camperdown, Richmond, and Lower Tugela Districts, due mainly to two causes, namely, irregular and improper dipping, and failure to report deaths promptly. Long familiarity with the disease in Natal has bred contempt and when it is not in the immediate neighbourhood there is a tendency for dipping operations to become slack and irregular, and at certain seasons they are even entirely suspended. During the year an increase of staff was authorized, but it was well into the summer months before suitable men could be obtained, and owing to the fresh outbreaks, in addition to the old infected areas which require close supervision, the whole staff was employed in infected and in-contact areas only. The additional inspectors, however, assisted very materially in checking and eradicating the disease in those areas, and on the whole the results were satisfactory. If the same supervision could be extended to all areas exposed to infection, East Coast fever could quickly be eradicated in Natal, and this extension of supervision thus prove economical.

Transkei.—During the year 58 fresh outbreaks were reported as against 56 during the previous year, and the areas in quarantine on 30th June, 1922, totalled 100, as compared with 70 a year previous. The following districts are free from the disease:—Matatiele, Qumbu, Tsomo, St. Marks, Xalanga, Nqamakwe, and Port St. Johns, west of the Umzumvubu River. Unfortunately, there was a recrudescence of the disease in several districts, more especially in the Kentani, Butterworth, Engcobo, and Umzimkulu districts. This is attributable to a variety of causes, chief amongst which were the excessive rains following drought which prevented the proper dipping of cattle; the extensive movement of stock necessary during drought and the failure of the water supply at some tanks on account of the drought; non-co-operation of a certain number of stock owners who evade dipping; a tendency to slacken off dipping operations in some localities where the natives having dipped for many years become tired of the routine or, lulled into a sense of false security, feel there is no longer any danger to be feared from East Coast fever; and illicit movements of cattle, which, in these vast unfenced areas almost entirely occupied by natives, are practically impossible to check. The inadequate number of field officers and dipping tanks, too, must be regarded as largely responsible for the slow progress made in the eradication of the disease, but several new tanks are at present in course of construction and will be in readiness for the campaign against the disease next summer. The position in Eastern Pondoland, which is regarded as one wholly suspected area, may be considered satisfactory in view of the fact that out of a total of 151,000 head of cattle only 301 head have died from East Coast fever.

3. ANTHRAX.

This disease is still prevalent throughout the whole of the Union, and it is more than likely, in the large unsettled districts and native areas where police posts are few and far between, that many outbreaks are not reported.

In previous reports the serious nature of this disease was commented upon, and it was pointed out that anthrax is responsible for more losses amongst farm stock than the total losses from all other contagious diseases. It is a matter for regret that stock owners cannot be brought to realize the danger of skinning and cutting up the carcasses of animals dying suddenly and unexpectedly, notwithstanding the repeated warnings against the practice. The most important factor in the successful suppression of anthrax is the proper disposal of infected carcasses, but this is found most difficult to enforce owing to ignorance or carelessness on the part of the farmer and the lack of police supervision. The police do their best and render valuable assistance, but it is impossible for them to control the proper disposal of *all* suspected carcasses. If anthrax is to be successfully stamped out, it is imperative that the farmers assist, and it is high time they banded themselves together and pledged themselves to see that the carcasses of all animals which die from disease are either burned or properly buried. Most farmers are alive to the danger of cutting up anthrax carcasses, but the danger arises from the carcasses of animals supposed to have died of gallsickness, lamsiekte, etc., and eventually found to have died of anthrax, for these carcasses are often allowed to be cut up and the meat distributed far and wide.

Systematic inoculation and more general supervision are the only means by which we can satisfactorily deal with this disease, and the staff of the Division would need to be increased very considerably to obtain and maintain effective control over the large areas where anthrax is at present prevalent.

The prevalence of the disease in the Union will, sooner or later, result in the prohibition of the export of certain products except under permit issued on a certificate from the grower that his product comes from flocks not infected with anthrax. It will also be necessary for farmers themselves to take action in order to safeguard their present oversea markets, unless producers are prepared to face the consequences.

Cape.—Outbreaks are still on the increase in the Cape Province. The excess of reported outbreaks over last year numbered 29. The mortality also shows a corresponding increase, whilst the number of animals inoculated has more than doubled. The increased mortality, it is considered, is not due to more widespread inoculation, for everywhere the reports as to the results obtained with spore vaccine are encouraging: 198 outbreaks were dealt with, in the course of which 1033 animals died and 38,475 were inoculated. There were 169 outbreaks during the previous year.

Transvaal.—The number of outbreaks totalled 684, as compared with 800 during the previous year, and approximately 98,000 animals were inoculated. The disease is particularly persistent in the districts of the Witwatersrand and Pretoria.

Natal.—86 outbreaks were dealt with, involving the death of 320 head, and the inoculation of 34,526. During the previous year 105 outbreaks were reported.

Orange Free State.—The disease is still widely prevalent, the most heavily infected districts being Kroonstad, Lindley, Boshof, Bloemfontein, Heilbron, Winburg, Vrede, Senekal, Thaba 'Nchu,

Hoopstad, and Ficksburg. The present field staff of the Division in this province is quite inadequate to cope satisfactorily with the disease. The total number of outbreaks was 323, as compared with 307 in the previous year, while 58,699 animals were inoculated and 1353 deaths were reported.

Transkei.—303 outbreaks were dealt with, as compared with 493 during the previous year, and of 27 magisterial districts, the disease is endemic generally in 23 districts. In the Transkei the disease can be regarded as second in importance only to East Coast fever, and it is felt that only by systematic inoculation can satisfactory progress be made towards its eradication.

4. TUBERCULOSIS.

Generally speaking, with the exception of a certain number of tests conducted for the Friesland Breeders' Association and other owners, only actual outbreaks of this disease were dealt with. Neither the staff nor the funds available for payment of compensation, render it possible to follow up the source of infection, and there is little doubt that until the position is improved in these respects little or no headway will be made towards the complete eradication of the disease.

Cape.—The restrictions imposed in the districts of the Cape and Stellenbosch were removed, as it was felt that no good purpose was being served by retaining them in such a limited area; 13 outbreaks were dealt with and 2574 animals tested, of which 138 reacted. Of the latter number 118 were destroyed. The total number of animals tested last year was 2319, of which 103 reacted.

Transvaal.—Two outbreaks were brought to the notice of the Division, while 75 animals were tested at the request of owners, chiefly in the case of animals about to be dispatched to destinations outside the Union.

Natal.—Seven outbreaks were dealt with in the course of which 1574 animals were tested, of which 51 reacted.

Orange Free State.—Three outbreaks were discovered, as compared with 1 during last year.

Transkei.—One case was discovered, namely, at Idutywa. The animal was destroyed and the in-contacts tested, with negative results.

5. DOURINE OR SLAPSIEKTE.

Cape.—47 outbreaks were dealt with, involving 1155 animals of which 102 either died or were destroyed, the districts concerned being Barkly West, 26 outbreaks; Hay, 5; Herbert, 2; Kuruman, 9; Taungs, 2; and Vryburg, 3. The outbreaks of this disease in 1920-21 totalled 39.

Transvaal.—No fresh outbreaks were reported, but one farm still remains in quarantine.

Natal.—No outbreaks were reported.

Orange Free State.—The disease was discovered on certain farms in the Boshof District, resulting in the destruction of 39 animals. In addition, six farms were quarantined as a precautionary measure, but no cases occurred thereon.

Transkei.—No outbreaks were reported.

6. GLANDERS.

In the Cape only 3 outbreaks were dealt with, as compared with 15 in the previous year; 12 animals died or were destroyed, while 25 in-contacts were involved. In the Transvaal 4 outbreaks occurred and 530 animals were subjected to the mallein test. A serious outbreak occurred at Nigel in the Heidelberg District, in connection with which 373 animals were tested. There were no outbreaks in the Orange Free State or Natal, and in the Transkei only one case occurred, in the Tabankulu district, where the infected animal was destroyed.

7. MANGE.

This disease is widespread throughout the Cape Province, still mostly in the large towns, as was the case in 1920-21; 105 outbreaks were dealt with as compared with 148 the previous year; 23 animals died or were destroyed out of a total of 349 in-contacts. In the Transvaal there were 96 outbreaks, as compared with 139 during the previous year. The chief source of infection is still the Witwatersrand area, where the prevalence of the disease continues to be a source of trouble. In Natal there were 9 outbreaks, as compared with 6 during the previous year, and in the Orange Free State 8, as compared with 5. In the Transkei 28 cases were reported, as against 17 during the previous year; 14 of the fresh outbreaks occurred in the Indutywa district; 9 in Nqamakwe; 2 each in Matatiele and Umzimkulu, and one in Mount Currie. All the cases were successfully treated.

8. OTHER PROCLAIMED DISEASES.

Epizootic Lymphangitis.—There were 5 outbreaks of this disease in the Cape Province; 2 in Bathurst, and 1 each in Barkly West, Humansdorp, and Uitenhage districts, as compared with 10 outbreaks during the previous year; 6 animals died or were destroyed. No outbreaks were reported in the other provinces.

Swine Fever.—No outbreaks of this disease occurred.

Lung-sickness.—No outbreaks of this disease occurred.

9. NON-PROCLAIMED DISEASES.

Horse-sickness.—The usual number of inoculations was conducted. In the Transkei the disease made its appearance at Port St. John's, but ceased without any undue mortality occurring.

Quarter Evil is still prevalent and inoculations continue.

Blue-tongue was prevalent in certain districts in the Cape Province, notably Middelburg, Graaff-Reinet, and Cradock. In some parts the presence of the disease is attributed to the abnormal and early hatchings of mosquitoes.

10. STATISTICS.

The usual returns are subjoined:—

(i) IMPORTS OF ANIMALS: YEAR ENDED 30TH JUNE, 1922.

(a) *Animals Imported into the Union from Oversea.*

Ports of Entry.	Cattle.	Horses.	Pigs.	Sheep and Goats.	Dogs.	Cats.	Zoological Specimens and Miscellaneous.	Total.
Capetown... ...	39	106	34	22	71	14	9	295
Port Elizabeth ...	1	—	2	1	2	—	—	6
East London ...	1	—	—	139	4	1	—	145
Durban	44	90	3	355	36	4	51	583
Total ...	85	196	39	517	113	19	60	1,029

(b) *Statement showing Breed and Sex of certain of above.*

CATTLE.

Breed.	Males	Females.
Angus	1	1
Jersey	2	6
Shorthorn	13	29
Kerry	—	5
Hereford	3	1
Friesland	3	2

CATTLE—(*continued*).

Breed.	Males.	Females.
Ayrshire	2	8
Red Poll	2	4
South Devon ...	1	2
Total	27	58

HORSES.

Stallions and Colts.	Mares and Fillies.	Geldings.
46	111	39

SHEEP AND GOATS.

Breed.	Rams.	Ewes.
Sheep—		
Suffolk	2	14
Merino	245	225
Romney Marsh ...	—	12
Wanganella ...	—	7
Shropshire ...	5	—
Miscellaneous ...	1	—
Goats—		
Toggenburg ...	3	3
Total	256	261

PIGS.

Breed.	Boars.	Sows.
Berkshire	1	2
Large Black	9	24
Gloucester	1	2
Total	11	28

(c) Cattle Imported into the Union from adjoining Territories.

From.	For Slaughter.		For Restocking.	
	1921-22.	1920-21.	1921-22.	1920-21.
	No.	No.	No.	No.
Southern Rhodesia	11,980	12,031	1,936	4,506
British Bechuanaland	23,709	23,685	4,096	10,069
South West Africa	17,342	11,239	4,134	—
Swaziland	6,558	5,031	—	—
Basutoland	—	8	—	—
Total	59,589	51,994	10,166	14,575

(ii) CATTLE DIPPING TANKS AS AT 30TH JUNE, 1921 AND 1922.

Province.	1921.	1922.
Cape (exclusive of Transkeian Territories)...	1,773	1,852
Transvaal	2,036	2,684
Natal { Private	4,908	5,035
Natal { Native	401	405
Orange Free State	268	314
Transkeian Territories	817	820

Dipping Tanks.—During the period under review 316 applications were made to the Land Bank for advances for the construction of dipping tanks. In the nine *infected* districts in the Transvaal there were 2283 dipping tanks in commission on the 30th June, 1922, as compared with 1656 on the 30th June, 1921.

(iii) EXPORT OF MEAT.

During the twelve months ended 30th June, 1922, 6023 head of cattle, as compared with 15,170 during the twelve months ended 30th June, 1921, were inspected for export, and the following was the quantity of beef exported, viz.: 1920-21, 42,887 quarters; 1921-22, 6727 quarters. During 1921-22, 830 sides of bacon, 382,100 lb. of pork, and 310 pork carcasses were exported.

(iv) LEGAL PROCEEDINGS INSTITUTED BY DIVISION, YEAR ENDED 30TH JUNE, 1922.

Province.	Prosecutions.	Fines.
	No.	£
Cape (exclusive of Transkeian Territories)...	369	906
Transvaal	1,025	2,370
Natal	1,545	3,603
Orange Free State	4	22
Transkeian Territories	1,645	2,489
Total	4,588	9,390

Report No. III.

VETERINARY EDUCATION AND RESEARCH.

Director of Veterinary Education and Research:
SIR ARNOLD THEILER, K.C.M.G., D.SC., ETC.

1. ADMINISTRATION.

DURING the year it was possible to adopt gradually the main principles of the reorganization of the Division, as laid down in the memorandum submitted from Vryburg in November, 1919, and subsequently adopted by Parliament.

In view of the financial situation research work had to be cut down to the lowest possible minimum, and several important investigations that were either in hand or in contemplation had to be abandoned. Although the reasons for curtailment of expenditure are fully realized, restriction of research work is not actually in the economical interests of the country.

Owing to the shortage of professional staff and the urgent necessity for economizing in every direction, the laboratory at Grahamstown was temporarily closed down as a research institute. Arrangements were made, however, to maintain its functions as a routine laboratory, and farmers in the eastern districts of the Cape Province have been able to obtain any vaccine or laboratory product required, and blood smears are still being examined there.

2. ROUTINE WORK.

Anthrax Vaccine.—800,330 doses were prepared and issued from Onderstepoort of the single spore vaccine, and towards the end of the year a double injection vaccine was introduced, of which 19,260 doses were supplied. The issue of single spore vaccine showed an increase of 182,862 doses over the previous year, Pietermaritzburg and Grahamstown laboratories retailing 43,945 and 62,265 doses respectively out of the total production. During 1920-1921, 430,165 doses of the Pasteur method anthrax vaccine were supplied, but the issue was discontinued in 1921-1922.

Quarter Evil Vaccine.—The output showed a considerable reduction, only 358,050 doses being prepared and issued from Onderstepoort

as against 547,920 doses for the previous year. The difference was due to provincial variations.

Wire-worm Remedy.—The output varies annually; this year it was 5,466,500 doses, against 4,488,800 last year, bringing the total issues since the remedy was introduced in 1917 to over 30½ million. For the powder form of administration 4451 dosing spoons and 634 dosing bowls were issued. For liquid dosing, including sheep and cattle, 13 liquid dosing spoons, 277 phials of hydrochloric acid, and 37 litre measuring tins were issued.

Blue Tongue Vaccine.—A decrease in output has also to be recorded, the issues being 712,416 doses, compared with 845,213 doses the previous year, due probably to the general financial depression during the year, farmers preferring to run the risk of mortality rather than incur further expenses.

Redwater and Gallsickness Vaccine.—Another decrease is to be noted, 9171 doses having been issued as against 17,557 in the previous year. The issues of this vaccine showed remarkable increases during the period 1916 to 1921, over 117,000 doses being issued in those five years, whereas in previous years the annual output remained fairly constant, and averaged about 10,000 doses.

Contagious Abortion Vaccine.—The issue of the "live" contagious abortion vaccine was commenced during the year, and a total of 1745 doses dispatched up to 30th June.

Dip Testing Materials.—1320 litres (equivalent to 132,000 tests) of dip-testing fluid, 1100 large tins, 160 small tins, 2950 books of test-paper, and 85 measuring spoons were issued.

Inoculation of Mules against Horse-sickness.—A sufficient quantity of serum and virus was supplied for the inoculation of 3638 mules against horse-sickness. Returns are available of 2413 inoculations undertaken during the year: 1973 of these mules were inoculated at owner's risk, and the remaining 440 under the insurance scheme. The amount of the premiums paid into revenue totalled £445, against which payments in respect of compensation amounted to £195.

Microscopical, Pathological, and Serological Work.—The usual microscopical and pathological routine work was undertaken at the various laboratories, the number of specimens examined at Onderstepoort amounting to 23,547, at Pietermaritzburg to 18,004, and at Grahamstown to 690. The Onderstepoort and Grahamstown figures show a slight decrease compared with last year, whereas at Pietermaritzburg an increase of 3995 examinations occurred.

Agglutination tests for the diagnosis of contagious abortion were continued at Onderstepoort and at Pietermaritzburg, 4089 being undertaken at the former station and 774 at the latter, the proportion of positive to negative results being approximately 2 to 7 in the Transvaal and 1 to 6 in Natal.

Approximately 800 various samples were received for examination, half of these being in connection with the investigational work of the Division, and the other half having been received from the public or from officers of other divisions. The total is distributed, in round numbers as follows:—200 dip samples, 50 dipping materials,

250 vegetation samples, upon 100 of which full analyses have been made; 100 poisoning cases and 200 "miscellaneous," including foodstuffs, waters, stock remedies, vaccines, blood and urine examination, etc. The total number of actual determinations runs into several thousand and need not be detailed.

Stock Dip Regulations.—Towards the end of the year the technical executive work of the stock dip regulations was undertaken in regard to registration forms, and conformity of composition of products offered for sale with guarantee under the regulations. It may be remarked that failure to produce sound scientific articles is due to ignorance of requirements rather than to deliberate fraud, and that the problem of control is likely to find its solution in advisory work for manufacturers rather than in prosecution under the Act.

3. RESEARCH WORK.

Lamsiekte in Cattle.—The experiments continued the work of previous years, and were also developed in new directions of great economic importance. The present programme includes further experiments upon the most economical mode of phosphorus feeding and the most economical compounds to use; upon the influence of factors such as age, weight, and individuality, in relation to phosphorus requirements for nutrition and for control of lamsiekte through control of osteophagia; upon the influence of phosphorus and other compounds on skeletal development, rate of growth and speed of reaching maturity; upon milk yield of cows and upon food consumption. It also includes experiments designed to bring out the influence of nutritional factors other than phosphorus, and to elucidate completely the causes of the winter fall in butcher-weight of stock on poor veld grazing.

These involve a study of soil and climate; of the physiology of stock nutrition; of the chemical and botanical composition of indigenous grasses; and of influences such as overstocking and veld-burning on the nutritive value of the pasture. These are all practical problems, the solution of which has an immediate economic value. The most striking results so far obtained bear upon the nutritional aspect of phosphorus deficiency, and show that phosphorus is a limiting factor in the growth rate of cattle, and a dominant factor in the maintenance of live-weight under ordinary conditions of veld grazing. The cost of phosphorus feeding must, therefore, not be credited only to insurance against lamsiekte, but also to increase in beef production. A profit and loss account in some of the Armoedsvlakte experiments shows a clear profit of 300 per cent. upon the cost of treatment. Since the areas in the Union to which the nutritional factors apply are far wider than those over which lamsiekte occurs, the annual financial gain to the stock-raising industry in the future can easily be made to exceed the annual financial losses from lamsiekte in the past; so that the disease itself, by focussing attention upon greater issues, will ultimately prove to have been a blessing in disguise, and the expenditure upon the present investigations be reflected in the beef export trade of the Union.

The results of the present experiments upon cattle have been so striking that the nutritional factors involved are being explored in all directions, and considered especially in regard to sheep and horses.

From the strictly disease point of view, the earlier work is being continued upon the conditions of toxin production, the distribution of the toxicogenic saprophyte throughout the Union, the study of putrefactive bacteria, and similar problems; although shortage of staff necessitates subdued activity in such directions.

Pica Survey.—This work, initiated in 1920, has been abandoned as a consequence of the reduction in divisional expenditure. The data already acquired are, however, of considerable value, and indicate the necessity of continuance the moment finances permit. The results will bear not only upon the control of lamsiekte, but directly upon the beef-production of the Union.

Anthrax.—Further experiments were undertaken with a view to adjusting the strength of the spore vaccine so that it would confer sufficient immunity to stop and prevent an outbreak of the disease, and yet cause no ill effects in the inoculated animals. The results of previous experiments were confirmed; goats were very much more susceptible than other animals, and it was found advisable to make a special vaccine for use on these animals, which is now being issued and applied with good results. This same *double* vaccine is also recommended for milch cows and in other special cases.

Experiments were also commenced in the Orange Free State with the object of establishing the rôle that the horsefly plays in the spread of anthrax. Various observations made it extremely probable that these flies are responsible for many severe outbreaks. Unfortunately, the experiment had to be discontinued because no further cases appeared on the farm where the work was carried out. It is hoped that conclusive evidence will be obtained during the coming year.

A number of tests was also conducted with the Australian spore vaccine (McGarvie Smith Institute, Sydney, New South Wales), reference to which has appeared in the press. These tests confirmed the earlier conclusions that the Australian vaccine was undoubtedly good and produced a very strong immunity. Immediately after vaccination the animals withstand very large doses of virulent material. In test sheep it was found that the immunity began to decline after six months. The claim that the vaccine produces life-long immunity could not be substantiated. It was further found that the Australian vaccine when inoculated into goats produced a mortality of about 20 to 30 per cent. Comparative tests between the Australian and the Onderstepoort spore vaccine showed that the immunity produced is about the same in both, that, however, the Australian vaccine produced worse swellings in horses, and that it is positively dangerous for goats.

Quarter Evil.—Fairly successful experiments were carried out to find a reliable vaccine in liquid form. Such a vaccine has been prepared, and the results obtained from the use of several thousand doses issued free to farmers are very encouraging. Further experiments, having for their object the improvement of this vaccine, are

still proceeding, and it is hoped to issue a reliable black quarter vaccine in liquid form during the coming year.

Nagana.—The officer in charge of the experimental station in Ntambanana Settlement, near Empangeni, Zululand, which had been started for the study of nagana, was severely handicapped at first by lack of accommodation, but in the course of the year his efforts were attended by a large measure of success. In trying the various remedies that had been recommended, it was found that tartar emetic gave very good results. This treatment has now been applied on a very extensive scale to the cattle of the settlers, with the result that the mortality from nagana has been reduced to a very low figure. Some other important points were settled in the course of these investigations. It was observed that there were more than one species of trypanosome responsible for the disease in Zululand, the small species (*Trypanosoma congolense*) causing the greatest trouble in cattle. The investigations are being continued.

Horsesickness.—Of a total number of 2413 mules inoculated against horsesickness the mortality was about one per cent., considered very satisfactory indeed. Investigations into the inoculation of horses were continued with the object of making the method *safer* and *simpler*. Although it has not been possible so far to simplify the method to any appreciable extent, considerable progress can be reported in reducing mortality. Amongst the horses treated at Onderstepoort according to this improved method, the mortality was reduced to 2·5 per cent.

The inoculation of horses for private owners, which had to be abandoned for financial reasons, was restarted. The conditions governing the inoculation were amended so as to give preference to bona fide farmers who wished to have their riding or transport horses inoculated. The maximum valuation now accepted is £15 per horse. The fee for inoculation amounts to £5 per head, which includes the cost of feeding and stabling the animal for a period of four to six weeks, but excludes transport expenses which must still be borne by the farmer. In the event of the horse dying as a result of horsesickness, compensation to the fixed amount of £15 is paid. Some further experiments were undertaken with the object of elucidating the cause of *staggers*. Although a few cases of this disease appeared among the horses in one experiment, it is not possible as yet to produce the disease at will, and its ultimate cause is still obscure.

Dourine.—The serological test for this disease was introduced and found to give good results. The value of the test lies in the fact that by means of it, cases can be detected before they show clinical symptoms of the disease, thus making it possible to remove or destroy such animals before they have done much harm; and secondly, that in doubtful clinical cases it is possible through the test to decide whether the animal is suffering from dourine or not. Experiments on the treatment of the disease are being undertaken.

Studies on the Normal and Diseased Blood of Horses.—These were conducted by one of the research officers and yielded some very interesting results. It was found that sex, food, water, etc., had practically no influence on the number of red corpuscles in the blood, whereas the number differed very markedly with the mode of life of

the animal. Stabled horses have less blood corpuscles than working animals, and these again less than race horses in training. Other points of physiological and pathological interest were also investigated.

Nodular Worm Disease in sheep appears to be gaining in importance in South Africa, and heavy losses are ascribed to it in various parts of the country. The life history of the parasite (*Oesophagostomum columbianum*) has now practically been cleared up. It has been found that the larvae in their third stage bore into the mucous membrane of the intestine and give rise to the nodules to which the disease owes its name. They do not remain in the nodules for long, but leave them again in the fourth stage after about six to eight days, and complete their development in the lumen of the intestine. These observations at once reveal the difficulty in attempting to treat the disease, and at the same time indicate the lines that should be followed in conducting such therapeutic tests. The investigations are being continued, especially along therapeutic lines.

Scab.—A series of experiments was conducted during the year in connection with the life history of the scab parasite. One experiment had the purpose of retesting the infectivity of kraals. The test was so arranged as to meet all the objections of the farmers against previous experiments. The result confirmed the conclusion previously arrived at. Various other interesting experiments were carried out with the acari themselves. A number of dips was also examined, and their action on the acari studied.

Bloedpens.—This disease was studied wherever opportunity offered itself. Valuable information was obtained, but many points still remain to be cleared up.

Malta Fever.—Some observations and experiments were started with the object of establishing the distribution of this disease amongst animals (especially goats) in South Africa, and of introducing a test for diagnosing the disease in the blood. This test is now being carried out, and the disease has actually been diagnosed in some goats. The question of the relationship between Malta fever and contagious abortion is now receiving attention.

Spirochaetosis in Pigs.—The pathology of this disease was investigated. It was found that the infection is by no means very rare in South Africa. Several cases of spontaneous infection were diagnosed. The disease was transmitted in various ways. The spirochaetes seem to have a predilection for the skin, the genital organs, and the lungs. The disease very often runs a mild course and results in spontaneous healing. Therapeutic tests are therefore somewhat unsatisfactory.

Gousiekte.—Earlier experiments were repeated and the conclusion confirmed that *Vangueria pygmaea* is the cause of the disease. The plant appears to be more toxic in the early stages of growth than later in its development.

Krimpsiekte.—Feeding tests were carried out with various species of Cotyledon. Positive cases of krimpsiekte were produced with *Cotyledon wallichii.*

Other Toxic Plants.—All through the year toxicity tests were carried out with *gifblaar* (*Dichapetalum cymosum*). An explanation was found for the earlier contradictory results. It was proved that only the young leaves are toxic. In the spring cases of poisoning are, therefore, most numerous, but later in the season, when most of the leaves have matured and lost their toxicity, a new batch of young leaves appears which again proved to be very poisonous. Numerous feeding experiments were conducted with suspected plants that were sent in by farmers and others and were reported to be injurious to stock. In practically every instance, the result of the feeding test at the laboratory was negative.

Miscellaneous.—Various other diseases were investigated during the year, but in most cases no definite conclusions were arrived at. Amongst these diseases may be mentioned the so-called *Sweating Sickness in Calves*, a disease which was first reported from Rhodesia a few years ago, and has since made its appearance in several other parts of South Africa. An officer of this Division made a preliminary investigation into the disease in Swaziland, where it is rapidly spreading, but in the absence of proper facilities, satisfactory experiments could not be conducted to clear up the nature of the condition. The investigations are being continued.

A peculiar disease in sheep with exudative inflammation of the skin leading to extensive formation of crusts was brought to the notice of the Division. A few sheep were sent to the laboratory, and amongst them one or two cases of paralysis of the hind quarters appeared. In these cases a degeneration of certain portions of the spinal cord was observed. This clue will be followed up as soon as more material can be obtained.

Preliminary investigations were also conducted on *Blue Udder* in sheep. This is a disease that has been described in Europe. Fortunately, it seems as if it is less virulent in South Africa than in Europe. Organisms were isolated from the diseased udder, and with them a somewhat similar condition was reproduced in experimental sheep. However, further work is necessary before any of these organisms can definitely be incriminated as the cause of the disease, and before therapeutic experiments can be commenced.

A condition in lambs known as *Aphtha* was also examined. Farmers have expressed the opinion that the disease is transmitted by means of flies. From the preliminary observations, it seems not unlikely that more than one distinct disease in lambs have been grouped under this name. The true aphtha is probably non-fatal; the cases of death in the same flock being most likely due to another cause.

Biochemical and physiological investigations into lamsiekte and other diseases are under consideration, including general veterinary dietetics; investigations into compounds of probable value in the destruction of external parasites of stock; studies of "rapid methods" for the determination of ingredients used in commercial dips; further experiments on dipping; influence of phenolic bodies upon bacterial changes in dipping tanks; improvements in methods for field assay of dip washes; and development of biochemical methods for clinical use in veterinary medicine.

4. VETERINARY EDUCATION.

Faculty of Veterinary Science.—This new departure deserves special mention. The first batch of students taking the B.V.Sc., of the University of South Africa, having completed the first two years "scientific" or "pre-clinical" training at the University Colleges, entered upon the third year of the five-year curriculum, or "first vocational" year at Onderstepoort, in February.

Of the seven pioneer students, two are already graduates of other faculties, one having previously taken a B.Sc., in Agriculture at Pretoria, and the other a B.Sc. in pure science at Stellenbosch. The subjects of study of the third year, and the teachers who conducted the courses, are as follows:—

Physiology II.	Prof W. H. Andrews.
Pathological Physiology ...	Dr. C. P. Neser.
Pathology I.	Sir Arnold Theiler.
Veterinary Anatomy III...	Prof. G. de Kock.
Embryology...	Prof. P. J. du Toit.
Ecology and Mycology ...	Mr. A. O. D. Mogg.
General Bacteriology	Prof. H. H. Green.
Special Bacteriology	Prof. P. R. Viljoen.
Biochemistry	Prof. H. H. Green.

In addition to these members of the staff teaching at Onderstepoort, three members, Prof. Andrews, Mr. M. W. Henning, and Mr. P. J. J. Fourie, conducted courses for students of the Transvaal University College in the Faculties of Veterinary Science and Agriculture.

In regard to teaching duties, it is important that the novel system of management should be explained. All teachers are primarily research officers of the Division, with ordinary official duties cognate to the subjects they profess, and tutorial work is semi-detachable both in regard to time and salary. Preparation for lectures is made outside of official hours, and teaching officers receive emoluments of £100 if of lectureship rank and of £200 if of professorial rank, in excess of those received by purely divisional officers to whom no teaching is assigned. In the event of any officer pursuing one duty to the detriment of the other the teaching function may be detached by the Public Service Commission, with corresponding detachment of salary. The system is working well, and has the great advantage of providing a large number of specialized teachers at low cost.

The other advantages of association with the Institute at Onderstepoort are already apparent. All the required post-mortem material, embryological material, bacteriological material, and clinical cases, have been obtained as a mere "by-product" of the research and routine activities of the Division; the large resources of which allow of an adequate training being offered with that staff, equipment, and material which are necessary for official work irrespective of the co-existence of the Faculty. Even in respect to buildings, the arrangement is economical since the Divisional laboratories provide research facilities for the staff, and but little special additional accommodation is devoted to exclusive student use. During the year there were only three rooms which had not served a dual purpose.

Report No. IV.

SHEEP AND WOOL.

Chief of Division: B. ENSLIN.

1 *Wool.*—The wool market reached its most acute form of depression towards the end of 1920 and the beginning of 1921, but began to show signs of improvement in May, 1921, after which date there was a steady demand for most types of wool at prices considered very satisfactory to growers. This improvement was largely due to the greater demand for continental account, principally Belgium, France, and Germany, which considerably advanced prices. Good average wool was sold in May, 1921, at 7d. per lb. For outstanding clips of extra super-combing as much as 22½d. was realized in February, 1922. Towards the end of the 1921-22 season practically all wool at the ports was sold. The year may, therefore, be considered a good one.

(i) EXPORT OF SCOURED WOOL, 1920 AND 1921.

Countries of Destination.	1921.		1920.	
	Weight. lb.	Value. £	Weight lb.	Value. £
United Kingdom	4,725,361	420,151	4,576,007	950,138
Canada	23,496	1,679	–	—
Belgium	1,853,554	122,061	1,375,834	265,844
France	159,047	12,635	9,361	1,063
Germany	1,438,185	108,885	224,032	32,508
Holland	91,247	8,021	70,343	13,951
Italy	—	—	19,605	5,328
Norway	—	—	9,531	2,232
Sweden	10,771	1,091	—	—
Japan	14,880	1,636	2,959,539	711,619
United States of America... ...	3,212,165	350,191	3,864,963	1,015,365
TOTAL	11,528,706	1,026,350	13,109,215	2,998,048

(ii) EXPORT OF GREASE WOOL, 1920 AND 1921.

Countries of Destination.	1921.		1920.	
	Weight. lb.	Value. £	Weight. lb.	Value. £
United Kingdom	97,153,131	3,168,987	38,048,481	4,303,335
Canada	30,086	1,445	—	—
South-West Africa...	7,100	118	—	—
Belgium	25,903,617	698,047	15,202,776	1,275,016
France	20,934,783	592,588	1,230,263	90,471
Germany	48,414,736	1,527,920	7,114,233	320,460
Holland	3,320,306	107,467	1,952,474	94,742
Italy	2,371,000	84,800	1,512,495	161,991
Japan	7,306,674	396,639	28,942,693	5,193,095
United States of America... ...	13,394,977	629,564	12,392,117	1,550,945
Russia	10,982	600	—	—
Sweden	45,817	2,310	—	—
TOTAL	218,893,209	7,210,485	106,395,532	12,990,055

Average price, 1921: Scoured wool, 21·36d.; grease wool, 7·90d. Average price, 1920: Scoured wool. 54·88d.; grease wool, 29·30d.

The high average prices for grease and scoured wools in 1920 were due to the abnormal state of the market towards the end of 1919 and the beginning of 1920, when up to 85½d. was paid for grease wool. Towards the end of 1920, however, the market for nearly all commodities had become very depressed, and in consequence of the unsettled state of the world's markets the banks refused to make advances on produce. Many farmers, entirely dependent on the sale of their produce, were therefore faced with ruin when the interest on the mortgages on their farms became due. In order to come to their assistance the Government appointed a Commission to proceed to Germany to find an outlet for South African produce, but the negotiations failed. The Imperial Government was then approached, and satisfactory arrangements were made for the purchase of the balance of the 1919-20 season's wool clip on the basis of prices ruling during the season 1913-14. Owners of wool who desired to sell were required to register their clips within a certain period, and to deliver same to the Government through brokers at the coast who had been appointed as Government agents. As the prices offered were considerably above the ruling market prices for most of the types, the offer was eagerly accepted by all who held wool. Owing to the state of the market it was expected that the deal would be a loss to the Imperial Government, but in view of the improvement that has taken place, a profit will probably be made.

On account of the large stocks of wool which had accumulated in America, and in order to protect the interests of wool growers in the United States of America, the Government of that country introduced an Emergency Tariff in May, 1921, for a period of six months (since extended), imposing a duty of 15 cents per pound on grease wool. This duty meant that South Africa was at a great disadvantage in competing for the American market, owing to the heavier class of wool grown in this country as compared with Australian wools.

Representations were immediately made to the Government of the United States by the Union Government and by commercial houses, pointing out that the imposition of wool duties on a weight basis would be specially prejudicial to South Africa by reason of the lower average yield of this country's clips, and that if an import tariff was considered necessary, it would be preferable from a South African point of view that it be levied on an *ad valorem* basis, the latter being calculated according to clean scoured results. The new customs tariff, however, has been based on the clean scoured yield, and imposes a duty of 12½ cents on wool of a 37 to 40 per cent. yield, 10·6 cents on 29 to 34 per cent. yielding wools, and 33 cents per pound on scoured wools.

There appears to be a steadily increasing demand for expert services; the Department will be better able to cope therewith in the coming season on account of the expert staff having been increased by six young men who have taken sheep and wool courses at Grootfontein and in Australia. Farmers are beginning to realize more than ever that their only salvation lies in improved methods of production, and that the growing and proper marketing of good wool is a most stable and lucrative investment for capital to-day.

The work performed by the expert staff is reflected yearly in the general improvement in quality and quantity of the Union's wool clip. The farms are being improved and the general system of management is becoming much more efficient. A large conservative element of farmers, however, still remains to be converted to the advantages of modern wool-growing methods. The excellence of the general average of Australia's flock sheep was brought about solely by sheep classing and good management of flocks. At present the average weight per fleece in the Union is only about 6 lb. This must be increased. If within the next 10 years the weight per fleece in the Union is increased by 2 lb., at 1s. per pound the value of the Union's clip will be increased by £2,500,000.

There are great possibilities for the expansion of the merino sheep industry in the Union. Owing to the decrease in the world's merino wool supply, every effort should be made to increase production.

2. *Wool Classing.*—There was a certain amount of improvement in this direction, but not nearly enough. There are still too many farmers who pay little or no attention to the "get up" of their wool. Great credit is due to those progressive men who by carefully classing their clips are building up a good name for the South African article on the world's markets. The present expert staff is doing everything possible to achieve that object. Short courses in wool classing at the schools of agriculture and demonstrations at farmers' meetings were also given regularly during the year.

A certain amount of false packing still continues to be indulged in by unscrupulous growers, and unless steps are taken to deal summarily with these offenders, the confidence in the Union wool clip overseas will soon be shaken.

South Africa can grow wool equal to that produced in Australia, but owing to the prevalence of scab and the continued pernicious system of kraaling sheep, a big percentage of the Union's clip is not marketed as attractively as it should be. As long as farmers tolerate

scab and persist in the kraaling of their sheep so long will their wool, on account of its dip-stained, dusty, and unattractive appearance, be handicapped on the world's markets.

The recent legislation in connection with jackal-proof fencing may be regarded as a great boon by those districts concerned.

The question of the improvement of non-woolled types of sheep by crossing with English breeds to produce a superior animal fit for the export trade is a very important one. Results obtained to date amply justify optimism and further expenditure and experiment in this connection. During the year the sheep and wool experts visited 1189 farms, on which they classed 334,611 sheep; gave 161 lectures, and judged at 38 shows.

3. *Mohair.*—The following is a statement of exports of mohair, showing the quantity and value of mohair, with countries of destination, exported during the years 1920 and 1921.

EXPORTS OF MOHAIR, 1920 AND 1921.

Countries of Destination.	1921.		1920.	
	Weight. lb.	Value. £	Weight. lb.	Value. £
United Kingdom	16,072,213	522,996	6,083,069	493,227
South-West Africa...	7,150	119	—	—
Belgium	4,196	62	21,054	2,015
France	19,879	552	34,490	1,327
Germany	17,956	496	—	—
Holland	11,735	262	—	—
United States of America... ...	994,786	59,156	151,275	22,404
TOTAL	17,127,915	583,643	6,289,888	518,973

Average price: 1921, 8·18d. per lb.; 1920, 19·80d. per lb.

The higher average prices for mohair exported during the year 1920 were due to the boom in the market towards the end of 1919 and the early part of 1920, and the fact that buyers principally confined themselves to the purchase of the better classes of mohair. The depression in the market towards the end of 1920 and the beginning of 1921 made the outlook for mohair farmers even worse than for wool growers, and urgent appeals were made by them to the Government to assist in the disposal of their produce. Endeavours were also made, at the time negotiations were carried on in regard to the wool scheme, to sell the surplus stock of mohair to the Imperial Government, but as a deal did not result a scheme was introduced in June, 1921, whereby farmers were able to obtain cash advances from the banks on wool and mohair held by brokers who had been appointed as Government agents under the scheme. Owing to the improvement of the market very little advantage was taken of the scheme, and only £1,250 approximately was advanced. This amount has already been repaid to the banks with the exception of £40.

The mohair market during the season 1921-1922 was, as far as summer kids and summer firsts are concerned, quite satisfactory

and up to 54d. per pound was paid during the season for super summer kids, while super summer firsts were sold at 16d. These may be considered as record prices. For other classes the market was less active, and inferior descriptions were difficult to dispose of.

4. *Scab.*—(*a*) *Legislation.*—Two important amendments to the regulations were effected. In July, 1921, the definition "Authorized Dip" was amended to include any manufactured lime and sulphur dip coming up to the standard of efficiency and sold with a guarantee as required by Government Notice No. 1034 of 1921, and section 23 of the regulations dealing with movements of sheep and goats into protected and semi-protected areas was amended so that the permit is now issued by the inspector from whose area the sheep are moved.

(*b*) *Compulsory Dipping.*—As the result of a conference of senior sheep inspectors at Pretoria in July, 1921, compulsory dipping was completed in 67 districts, viz.:—Cape (including Transkei), 45; Orange Free State, 14; and Transvaal 8; 948,985 sheep being dipped twice by the itinerant staff. Apart from compulsory dipping, 7,271,713 sheep were dipped twice under the supervision of area inspectors. The majority of these were clean sheep dipped as a precautionary measure on entering protected areas, as well as contact flocks. Comparing these figures with those of the year before, it will be seen that the itinerant staff dipped about half a million less, and area inspectors one million more sheep, the total of sheep dipped during the period under review exceeding that of the previous year by half a million. This is accounted for by the fact that some itinerant inspectors were seconded for duty in Swaziland, to which territory many farmers trek for several months in the year, while others assisted area inspectors in cleaning up their areas. Although it was found necessary to subject some districts, already protected, to a compulsory dipping owing to introductions of infected flocks, most of the dipping was carried out in districts which had no protection so as to clean them up and prepare them for protection. Reports from most of the districts are satisfactory, and to some a preliminary protection has been extended, which means that flocks moved into them from non-protected areas must be dipped, and when sufficient time has elapsed to judge of the position, semi-protection will be extended to them.

(*c*) *Protected and Semi-Protected Areas.*—During the year protection was extended to 27 districts, as follows:—Protected: Cape, 13; Orange Free State, 4. Semi-protected: Cape, 8; Orange Free State, 2. Present total for the Union—Protected: Cape, 28, Orange Free State, 16; Transvaal, 4. Semi-protected: Cape, 35; Orange Free State, 2; Transvaal, 1; Natal, 5.

(*d*) *Compensation.*—Two owners were compensated to an amount of £157 for stock lost through dipping. Certain claims were disallowed because they did not fall within the terms governing the payment of compensation. Considering the large number of stock dipped under supervision, the losses are very small indeed. This is a credit to the inspectors, proving that they exercise great care in administering the dippings.

(*e*) *Movements of Infected Stock.*—Notwithstanding the warning sent out the previous year that no facilities would be given owners

to move infected stock, the Department had again to give concessions in the Calvinia district on account of the drought; in such cases every possible precaution was taken to prevent infection of clean stock. But a large number of illegal movements took place, more especially in the drought-stricken districts. The following statement of stock received at the Johannesburg and Maitland abattoirs shows the number and percentage of infection found, which compares very favourably with the statistics of previous years. The improvement is attributed mainly to the strenuous dipping campaign:—

Locality.	Consignments.	No. of Sheep and Goats.	Consignments Infected.	No.	Per Cent. of Infection.
Johannesburg:					
From origin other than South-West Africa	6,702	762,388	88	11,026	1·16
From South-West Africa ...	137	27,790	64	12,885	46·70
Maitland:					
From origin other than South-West Africa	1,498	401,055	92	44,640	6·14
From South-West Africa ...	214	77,376	39	18,894	18·22

At Pretoria 1720 consignments comprising 167,172 sheep were received, of which five consignments comprising 1,032 sheep were infected. The inspector in charge of the Johannesburg abattoirs reports:—"Very few consignments of clean sheep arrived from South-West Africa up to September, 1921. Since then a vast improvement was noticeable, large consignments arriving thoroughly dipped and cleansed. Since November, 1921, up to 30th June, 1922, with the exception of one consignment in January, all arrived clean."

(*f*) *Flocks Quarantined*, 1921-22.—

Province.	Local.	Contacts.	Introduced.	Total.
Cape (excluding Transkeian Territories)	3,797	810	714	5,321
Transkei	2,027	153	96	2,276
Bechuanaland	502	238	88	828
Transvaal	1,870	2,288	508	4,666
Natal	956	257	208	1,421
Orange Free State...	771	164	144	1,079
TOTAL	9,923	3,910	1,758	15,591

Compared with the previous year, there is a considerable reduction in the number of actually infected flocks, the total of local infected flocks the previous year being 12,966, and introduced infected flocks 2341. The contact flocks need not actually be infected, but are quarantined and dipped as a precaution.

(*g*) *Other Diseases.*—Disquieting reports were received from different parts of the Union of flocks being badly infected with *Oesophagostomum columbianum* or nodular worm. This disease is

serious, and unless some effective specific is found it is going to cause considerable loss.

The blowfly, though not nearly so bad in South Africa as in Australia, is troublesome enough, and causes a fair amount of loss each year. Destruction of the fly, with proper crutching and dressing of the sheep with a powerful and effective disinfectant, is the only remedy.

The ked or sheep louse is becoming more serious each year. Ked or tick-stained wool is unattractive, and does not command the best prices, resulting in monetary loss. Keds are easily eradicated if properly dealt with, and all farmers should be compelled to cleanse their flocks of this pest.

5. *Small Stock Return.*—The following table is a return of small stock in the different Provinces as at the 30th June, 1922, and shows the losses through disease and drought:—

ESTIMATED NUMBER OF SHEEP AND GOATS AND LOSSES FROM DISEASE AND DROUGHT, 30TH JUNE, 1922.

Heading.	Cape (excluding Transkeian Territories).	Transkei.	Bechuana-land.	Transvaal.	Natal.	Orange Free State.	Union.
Number of Flocks ...	49,752	61,108	7,629	47,039	39,102	21,981	226,611
Sheep—							
Woolled	12,548,134	2,014,472	471,818	3,692,513	1,639,528	8,977,210	29,343,675
Non-Woolled ...	5,839,810	1,755	446,301	721,587	324,072	414,780	5,748,305
Goats—							
Angora	2,163,845	72,991	87,001	62,233	26,752	102,410	2,515,232
Others	2,720,816	1,032,657	501,483	1,099,797	1,012,359	78,610	6,445,722
Owners—							
Europeans ...	28,596	581	2,532	11,909	3,357	17,983	64,958
Natives	17,089	59,247	6,054	36,143	35,056	8,711	162,300
Losses from Disease—							
Sheep	441,829	109,583	42,019	144,822	53,521	303,758	1,095,532
Goats	98,400	89,937	27,042	47,892	22,940	3,810	290,021
Losses from Drought—							
Sheep	235,336	26,320	7,925	14,373	16,675	107,817	408,446
Goats	31,723	9,436	3,973	4,848	4,040	592	54,612

Summary: Total number of sheep ... 35,091,980   Total losses, sheep 1,503,978
" " " goats ... 8,960,954   " " goats 344,633
Total 44,052,934   Total 1,848,611

Report No. V.

ENTOMOLOGY.

Acting Chief of Division: CLAUDE FULLER.

1. *General.*—For six years past the energies of the Division have been regularly almost brought to nothing by the stress of periodic locust campaigns. Always understaffed, and of late years more so even than formerly, the administrative duties involved—coupled with the distribution of pumps and poison supplies—have been so great that the staff of the Pretoria office has staggered under the burden. There has never been a sufficient interval between one and the next campaign to recover lost ground. It has been impossible to study the bionomics of the locust and equally impossible to design experiments towards finding new methods of destroying the pest or to improve the composition of the poison used, with the exception of the experiments (referred to below) that were recently started by Mr. Mally. Entomologists, plant inspectors, and any available officers of the Division have had to take the field each season for months on end to direct operations, and to the entire neglect of those duties for which they were specifically engaged.

As such a state of affairs could not continue longer with the increasing severity and regularity of locust outbreaks, the administration of the locust law was partitioned off in September, 1921. It is now allocated to a senior administrative officer, assisted by a permanent senior locust officer and a temporary staff.

The depletion of the professional staff, to which reference was made in the preceding report, has not yet been made good. The Pretoria office remained during the year weakly staffed in an exceptional degree, considering the many professional duties expected from it. Investigational work continued largely upon the unsatisfactory level of recent years, circumstances precluding any of magnitude or importance.

During the year 1921-22 there was a marked revival of the fumigation of citrus orchards for scale insects. This was brought about by the rapid strides made in our orange-growing industry. Much advisory assistance was given by the Division in this connection, and practical help extended in the securing of suitable covers.

It is a pleasure to draw attention in passing to the remarkable and useful results of Professor J. C. Faure's recent study of the bionomics of the locust, an original research he has been able to undertake since leaving the Division and joining the faculty of the Transvaal University College.

2. *Branches.*—(*a*) *Cape South-West* (*Senior Entomologist*: *C. W. Mally, M.Sc.*).—The staff consists of two entomologists, one plant inspector, one clerk, and one European messenger, with headquarters at Capetown. The duties of the branch are multifarious. The recent appointment of an entomologist has enabled the senior entomologist to carry out a series of experiments with locust poisons, and from the progress made it is expected that valuable results will accrue. The experiments of last season will be repeated and extended during the

coming voetganger season. Special studies of the plant-infesting mites and their control are in progress.

(*b*) *Eastern Province* (*Entomologist*: *D. Gunn*).—The staff consists of one entomologist and one assistant entomologist, with headquarters at Port Elizabeth. Imported and in-transit plants, seeds, and the like are inspected and general duties performed. The principal studies undertaken were as follows:—(1) Life-history of the false codling-moth in Bathurst District; (2) coccinellid beetle (*Epilachna similis*), which destroys barley, maize, and wheat; (3) larger cabbage moth (*Crocidolomia binotalis*), which in the caterpillar stage destroys cruciferous plants, principally cabbage and cauliflower; (4) bean bug (*Acanthomia tomentosicollis*), a destructive insect in bean fields in the coastal districts; (5) *Colias electo* (the lucerne caterpillar); investigational and control work was conducted in Sundays River Valley, Patentie, and other places where lucerne is grown extensively; (6) *Parasa* sp. The caterpillars defoliated *Acacia cyclopsis* and *Acacia salina* in the Government Forest near Port Elizabeth, and life-history work was begun in March, 1922. (7) The life-history of the meal moth (*Pyralis farinalis*) was studied during the year. A large number of demonstrations was given for the control of codling-moth, scale insects on citrus trees, fruit-flies, etc., and also several lectures on the insect pests of deciduous and citrus trees as well as general farm crops.

(*c*) *Natal* (*Entomologist*: *C. P. van der Merwe*).—The staff consists of one entomologist, one assistant entomologist, and one plant inspector, with headquarters at Durban. The assistant entomologist, Mr. H. H. Harris, is at present located in the Umfolosi fly-belt, Zululand, and engaged upon the study of the bionomics of the tsetse fly. The casual investigations of the year cover the life-history and control of the elegant grasshopper, citrus psylla, button beetle, and mole crickets.

The investigation of the tsetse fly began last year and has already brought to light many important phases. The work has progressed so far that there is already some promise of practical measures being devised to narrow down the extent of the principal belts. The species found predominating in the more important belts has proved to be *Glossina pallidipes*, concerning the life-history and habits of which but very little was formerly known. The officer in charge of the studies has displayed the greatest enthusiasm and application, although beset by many handicaps and located in a highly malarious area.

(*d*) *Border* (*Entomologist*: *H. K. Munro, B.Sc.*).—The staff consists of one entomologist without assistant, with headquarters at East London. This office, inaugurated only last year, is already serving a very useful purpose. Particular attention is being given to the habits and control of the flies that "blow" sheep. An investigation of the native fruit-flies infesting wild olives has been commenced with a view to discovering parasites and the possibility of sending these to Italy to act as controlling agents for the olive-fly there.

3. *Nursery Inspection.*—The total number of plant nurseries registered for the nursery year—September, 1921, to September, 1922—was 399, an increase of 32 over the previous year; 365 nurseries were inspected (about 60 of these twice). Of the nurseries, 200 were in the Cape Province, 133 in the Transvaal, 35 in Natal, and 31 in the Orange

Free State. The number in the Cape increased by 12, in the Transvaal 13, the Orange Free State 7, whilst Natal remained the same.

The total number of plants, shrubs, ornamentals, trees, vines, etc., reported by nurserymen as likely to be ready for sale during the year, compared with the number for the previous year, was for 1920-21, 28,178,279, and for 1921-22, 26,976,751. Of these, forest trees comprise 21,188,515 and 19,505,055 respectively.

The total number of common fruit trees in process of production, but not expected to be ready for sale during the year, was reported to be:—Deciduous, 2,617,775 and 2,316,767; citrus, 952,800 and 1,071,425 for 1920-21 and 1921-22 respectively.

The number of new nursery quarantines imposed was twenty (of which seven applied to the entire premises) in 1921-22 against sixteen in 1920-21 and twenty-one in 1919-20. Red scale (*C. aurantii*) on citrus trees continues to be the chief cause for quarantine. At the close of the year nine quarantines were in force.

The citrus stock under quarantine aggregated 12,000 plants. A list of the nurseries in quarantine is published monthly in the *Journal* of the Department.

A disease which is causing some alarm in the Western Province, on peach stocks principally, is crown gall, whilst in the Maritzburg area many apple stocks are lost through the spread of *Sclerotium sclerotiorium*. The first case in the Transvaal of this latter disease was reported at Magaliesburg.

4. *Importations of Plants, Fruits, Seeds, and Beeswax.*—(i) *Plants.*—The importation of plants is reflected in the subjoined table. Pear stocks show a slight falling off, whilst the importations of cherry and plum stocks have been relatively high. Other items vary but slightly from the records of last year. European pear stocks continue to arrive infested to a slight degree with crown gall and scale insects.

The temporary suspension of the prohibition on blight-proof apple stocks, of which notice was given in the last report, led to the issue of permits for the introduction of 312,000 stocks through the winter of 1922.

IMPORTATION OF PLANTS, 1ST JULY, 1921, TO 30TH JUNE, 1922.

Kind.	Capetown.	Port Elizabeth	East London.	Durban.	Johannesburg and Pretoria.	Total.
Fruit Tree Stocks—						
Pear	143,000 (9)*	12,500 (2)	—	12,000 (2)	—	167,500 (13)
Cherry	20,500 (2)	4,500 (2)	—	5,000 (1)	—	30,000 (5)
Plum	5,000 (1)	—	—	—	—	5,000 (1)
Fruit Trees ...	312 (12)	—	—	354 (9)	350 (5)	1,016 (26)
Berries	255 (15)	1 (1)	6 (1)	157 (5)	130 (2)	549 (24)
Roses	243 (19)	66 (3)	109 (5)	85 (5)	155 (5)	658 (37)
Ornamental Shrubs	2,545 (56)	655 (5)	47 (2)	788 (14)	55 (7)	4,090 (84)
Osiers	—	—	—	—	150 (1)	150 (1)
Palms	271 (5)	250 (2)	—	57 (3)	—	578 (10)
Carnations	8,745 (31)	6,876 (10)	764 (5)	11,866 (32)	12 (2)	28,263 (80)
Chrysanthemums ...	305 (9)	146 (1)	—	430 (13)	132 (4)	1,013 (27)
Other soft plants ...	501 (28)	774 (5)	—	1,324 (5)	113 (6)	2,712 (44)
Sugar-cane... ...	—	—	—	8 (2)	—	8 (2)
Cuttings, various ...	—	—	—	2,102 (6)	14 (2)	2,116 (8)
Bulbs	136,292 (14)	103,475 (2)	18,460	75,284 (2)	12,192	345,703 (18)

* Figures in brackets refer to the number of separate permits issued for introduction.

(ii) *Fruits.*—The oversea fruit entering the Union was, in case units, half as much again in 1921-22 as in 1920-21 (approximately 7500 against 5000). The imports comprised 7000 cases of apples, 350 cases of grapes, 134 cases of oranges, and 16 cases of lemons. There has been no trouble of importance as regards insects and disease in connection with these imports.

(iii) *Seeds.*—Eight lots of cotton, eight of barley, and twenty-six of maize were admitted, each variety being limited to 10 lb.

(iv) *Potatoes.*—The importation of potatoes shows a considerable drop, 19,860 cases against 58,902 for the preceding twelve months.

(v) *Beeswax.*—The importations through all the ports were as follows:—Foundation comb, 6367 lb. (thirteen consignments); yellow wax, 10,267 lb. (five consignments); cera alba, 934 lb. (twenty-one consignments). The weight of cera alba fell to about half that of 1920-21, whilst the foundation comb and the yellow wax weights almost or quite doubled. The figures reflect not alone an increased activity on the part of beekeepers, but also of the local manufacturers of floor and furniture polishes. Cera alba is mainly imported for pharmaceutical purposes.

5. *Plant and Fruit Removals.*—During the year under review the regulations limiting the movement of apples, pears, quinces, and mangoes within the Union were withdrawn, and there are no longer any closed areas as regards fresh fruit other than that fresh grapes may not be sent into certain scheduled districts of the Cape Province.

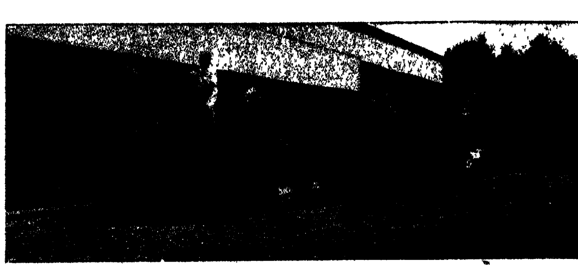
The inspection of plants in transit by post and rail recorded from the six inspecting stations totalled 697, of which 157 were fumigated.

6. *Publications.*—Apart from 105 short notes on various insect troubles and other matters germane to the work of the Division, the more important publications were:—

(1) "Insect Pests: A Factor in Green Manuring." By C. W. Mally, M.Sc., *Journal of the Department of Agriculture*, September, 1921.

(2) "The Sheep Blow-fly." By H. K. Munro, B.Sc., *Journal of the Department of Agriculture*, February, 1922.

(3) "The Termites of South Africa" (II). By Claude Fuller, *S.A. Journal of Natural History*, III, 2, March, 1922.



Report No. VI.

BOTANY AND PLANT PATHOLOGY.

Acting Chief of Division: ETHEL M. DOIDGE, M.A., D.Sc., F.L.S.

1. *Plant Pathology and Mycology.*—The work on the wastage in export citrus fruit was continued, and the results of the investigation were published in Bulletin No. 1 of 1922.

The situation with regard to citrus canker eradication continued to be satisfactory. During the year only four trees were found infected, and these were all on the farm Buffelspoort, in the Rustenburg District. During 1920-21 six trees were found on three different farms; on two of these no further infection occurred during the following year. An extensive field experiment is being carried out to test the advisability of replanting citrus trees after three to five years in orchards where infection with citrus canker has occurred.

Certain other citrus diseases, including verrucosis and scaly bark, are also under investigation. The latter disease has only been observed in this country within the last two years, and in certain areas appears to be spreading with considerable rapidity.

An outbreak of wart disease in potatoes (*Synchitrium endobioticum* Perc.) occurred in Natal. An inspection of potatoes on the farms in the affected area was organized as soon as the matter was reported, and is still in progress, but the origin of infection has not yet been discovered. Potatoes showing wart disease have up to the present only been found on two adjoining farms in the Impendhle Division, Natal. These are fortunately stock farms, and the owners only grow potatoes for their own use, so it is hoped that the disease has not become more widely distributed. No cases of infection were reported from the farms on the Boston area, near Impendhle, where potatoes are grown in considerable quantities.

Investigation work was considerably hampered during the year. Subsequent to the resignation of Dr. van der Bijl, a mycologist from Pretoria was transferred to Durban for two months, and the repeated absences from headquarters of the Chief of the Division and Miss Thomson in connection with the botanical survey, had the effect of throwing the whole of the advisory work on to the shoulders of the remaining members of the staff. As a result, very little progress was made in the investigation of citrus diseases and various other fungous and bacterial diseases which urgently need attention.

In connection with the advisory work many diseases of doubtful or obscure origin were reported. Some of them are likely to prove of economic importance and require investigation, but it is not possible to investigate many of these problems with the present staff. In particular may be mentioned two diseases of peanuts; in one case, the plants turn yellow and die without apparent cause; in another, the apparently healthy plants bear a large crop of nuts entirely devoid of kernels.

During the period under review no suitable mycologist was obtainable to take charge at the Natal Herbarium, Durban, and in consequence all investigation work at this station was at a standstill.

The Government Mycologist at Capetown continued his work on the causes of wastage in export citrus fruit; the results obtained were embodied in his report published in Bulletin No. 1 of 1922.

Spraying experiments on the control of pear scab, or *Fusicladium*, were carried out at Stellenbosch and Somerset West. The results show that good control can be obtained provided that sufficient applications are made *at the right time*. The winter stage of the pear organism was observed for the first time in South Africa, and a preliminary investigation made on the periodicity of the winter spores and the correlation between their liberation and the first outbreaks of *Fusicladium*.

Other plant diseases which are being kept under observation in the western Cape districts are the following:—Silver leaf disease; apple mildew, which is especially troublesome near Robertson and Montagu: "vrotpootje" of wheat; and certain loquat diseases.

2. *National Herbarium*.—During the year 5599 specimens of flowering plants were acquired by purchase, donation, or exchange, and 973 specimens sent in exchange or donated to other herbaria. Over 2500 determinations of plants were made during the year. In the cryptogamic section, 709 specimens were incorporated and considerable progress was made in the preparation of an exchange collection. An up-to-date reference index was compiled of the 1000 odd genera of fungi represented in the herbarium, with special reference to their systematic position. The necessity for this arose owing to the recent revision of many groups and the lack of any co-ordinated reference work on the matter. In the Botanical Museum 118 specimens of economic interest were incorporated. Among the donations received special mention should be made of an exhibit of Para rubber from the Research Laboratory, Petaling, and of tea from the Royal Botanic Gardens, Peringuay, Ceylon.

3. *Grasses*.—Miss Stent spent two months at the Kew Herbarium on a special study of South African grasses, taking with her for determination some 500 specimens from the National Herbarium and 300 to 400 from Rhodesia. It was found that certain genera badly need revision, and copious notes were made for future work along these lines. A large number of collections of indigenous grasses were named (including those made by Dr. Pole Evans on his frequent trips to the bushveld, by officers of the Division of Veterinary Research, and by other collectors, notably Mr. Eyles, of Rhodesia). Certain new species were found in these collections and are being described.

4. *Botanical Survey*.—A meeting of the Botanical Survey Committee was held at Grahamstown in November, 1921. Several matters of importance affecting the work of the survey were discussed. The Director reported that the Minister had authorized the publication of a Botanical Survey Guide, and also of Dr. Schönland's paper on the *Cyperaceae*. Dr. Bews read an interesting paper dealing with the question of slope in regard to the vegetation of the Natal coast, and also spoke on the subject of the origin, migration, and evolutionary tendencies of the Natal flora. He also outlined the work he had done in connection with the Pica Survey. Dr. Marloth gave an account of his trip with the Veterinary Research Officer from Grahamstown in

connection with investigations into the cause of krimpsiekte of goats and sheep. Dr. Schönland reported on the invasion of *Helichrysum argyrophyllum*, on the Amatola Mountains, and suggested that the Botanical Survey should take steps to investigate means of restoring the veld to the original condition of a grass veld.

Memoir No. 3 of the Botanical Survey of South Africa, entitled "South African *Cyperaceae*," by S. Schönland, and Memoir No. 4, "A Guide to Botanical Survey Work," were published during the year.

5. *Botanical Stations*.—Work at the Botanical Station, Prinshof, was carried on under considerable difficulties owing to the lack of proper fencing and suitable buildings. Since these were not forthcoming, owing to financial stringencies, it was decided to discontinue work at Prinshof and for the present to carry on the experiments at Groenkloof and the Dry-lands Station.

Special consideration was given to experimental planting of indigenous grasses, of which the Division has between seventy to eighty species under cultivation. Kikuyu grass still gives the best results as a pasture grass. It is superior to many veld grasses in that it can stand trampling by stock and also rooting by pigs; this being due to its aggressive rooting system.

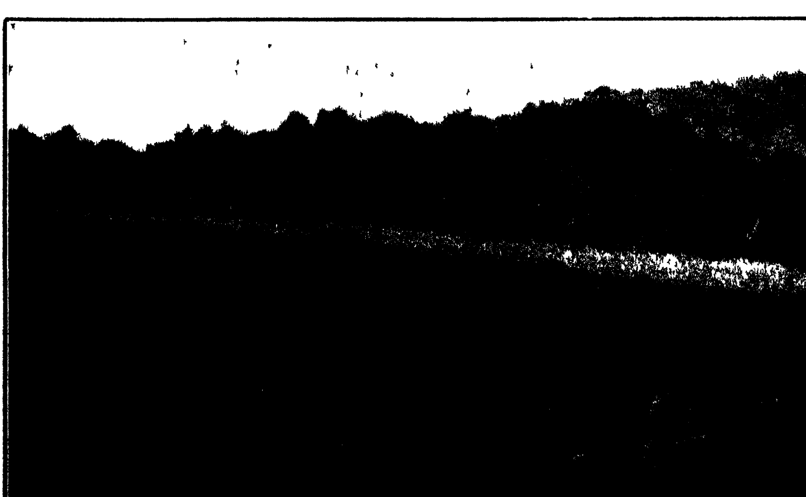
Natal grass (*Pennisetum unisetum*), a native of the Drakensberg, has proved to be most frost-resistant, and commences its growth in August, when most of the other veld grasses are still dormant. *Panicum laevifolium* (variously known as Old Lands grass, Pelala grass, Roll grass, or Blauwzaad-gras) is the best of the native hay grasses.

Of the exotic grasses under observation, Napier fodder (*Pennisetum purpureum*) can be recommended for ensilage. It does best on a warm moist soil. The frosts experienced during the winter were a severe test of the frost resistant qualities of the various grasses. The exotics were less affected by cold than the indigenous grasses, and *Phalaris bulbosa* and Rescue grass (*Bromus unioloides*) were conspicuous in this respect. Some interesting experiments were also carried out with various clovers, some of which were found to grow well with Kikuyu grass.

6. *Publications*.—The following is a list of the Division's recent publications:—

Title.	Author.	Published in.
A new species of *Pteronia* (*P. Foleyi* Phill. & Hutch.)	E. P. Phillips	Kew Bulletin, 1922, page 28.
A Possible Cattle Food (*Sesbania cinerascens*)	E. P. Phillips	*Agricultural Journal*, vol. IV, page 361.
The Thorn Pears (*Scolopia*, spp.)	E. P. Phillips	*Bothalia No.* 1, part II.
The Genus *Ochna*	E. P. Phillips	*Bothalia No.* 1, part II.
The Genus *Olinia*	E. P. Phillips and J. Hofmeyr	*Bothalia No.* 1, part II.
The Genus *Cyclopia*	E. P. Phillips and J. Hofmeyr	*Bothalia No.* 1, part II.
The South African Ascomycetes, Part II	E. M. Doidge	*Bothalia No.* 1, part II.
Investigations on Export Citrus Fruit during 1921	M. R. R. Thomson, V. A. Putterill, and G. Hobson	Bulletin No. 1, 1922.
Spineless Cactus as a Fodder for Stock	H. A. Melle	*Agricultural Journal*, vol. III, page 68.

Title.	Author.	Published in.
The Fungus Food of certain Termites	A. M. Bottomley and C. Fuller	*S.A. Journal Nat. Hist.*, vol. III.
Note on *Urophlyctis alfalfae* in Lucerne	A. M. Bottomley	*Agricultural Journal*, vol. IV, page 153.
Plant Diseases in the Western Province II.—Collar Rot in Orange Trees III.—Fusicladium or Scab of the Apple and Pear	V. A. Putterill	*Agricultural Journal*, vol. III, pages 259 and 343.
Fodder and Pasture Grasses of South Africa II.—Rhodes Grass III.—Star Grass	S. M. Stent and H. A. Melle	*Agricultural Journal*, vol. III, 1921, pages 136 and 271.
Wart Disease of Potatoes ...	E. M. Doidge	*Agricultural Journal*, vol. IV, page 447.
Plant Diseases in the Western Province IV.—Two Diseases of the Loquat V.—The Control of Pear Scab or Fusicladium	V. A. Putterill	*Agricultural Journal*, vol. IV, pages 332 and 430.
Dubbeltje (*Tribulus terrestris*) and Geeldikkop in Sheep	S. M. Stent	*Agricultural Journal*, vol. IV, page 548.
Poisonous Properties of Sudan Grass	S. M. Stent	*Agricultural Journal*, vol. IV, page 466.
The Weeds of South Africa—III VII	K. A. Lansdell	*Agricultural Journal*, vols. III and IV, 1921 22.
A Note on the Germination of *Elephantorrhiza burchellii*	J. A. Hofmeyr	*S.A. Journal Nat. Hist.*, vol. III, page 215.



Sudan Grass, Groenkloof Experiment Station.

Report No. VII.

DAIRYING.

Superintendent of Dairying: ED. O. CHALLIS.

1. *Staff.*—The Assistant Superintendent of Dairying, Mr. E. G. Hardy, returned from seven months' leave in England in December last, having been granted an extra month for the purpose of attending the London Dairy Show and carrying out, in conjunction with experts in London, examinations in regard to shipments of South African butter; he also visited Holland and Denmark. Much useful information was gained, especially regarding the condition of South African butter on arrival in London. It is only by occasional visits of this nature that full details of the conditions in which our dairy products are received on the overseas market, and the faults observed in them, can be obtained with the desired accuracy.

A new appointment of Cheese Grader and Instructor in Cheese-making was made last May, Mr. S. Groot being appointed on a three years' contract, and stationed at Aliwal North.

Experience showed the need of stationing an officer in the western districts of the Cape, with headquarters at Capetown, and Dairy Inspector Allison was appointed to this position.

2. *Creamery Matters.*—During the period under review everything pointed to a very large production of butter throughout the Union, but the total quantity was 12,327,732 lb.: the total production for the six months ended 30th June, 1921, was 8,727,094 lb. There are several reasons for this falling off, the chief being the abnormal reductions in the prices for butter-fat. No doubt the prices had to be considerably reduced to prevent a general collapse of the creameries in the Union, but whether, under the conditions which prevailed this season, the prices of 7d., 6d., and 5d. (and in one or two instances even less) for butter-fat were really justified is not quite clear. These low prices had a disastrous effect on the industry as a whole, and many producers refused to supply cream at these prices, and some reverted to individual butter-making, while others turned their cows out to run with their calves. This condition was followed at the latter end of the season by a severe drought, and when prices for butter-fat returned to a more normal basis very meagre supplies were forthcoming. To establish our dairy industry and export trade there appear to be two essentials, viz., a greater production on the part of the farmer through the improvement in his herds and treatment of same, and a far greater output by the various creameries to reduce overhead and manufacturing charges. If these two factors are not seriously taken in hand it is feared the Union will not be able to compete successfully in the oversea markets.

There is still much discontent on the part of cream suppliers in regard to the grading of their cream, and the percentage of butter-fat returned. Whilst admitting that no creamery is infallible and mistakes will occur, numerous investigations by officers of this Division have not substantiated the allegations made by the various

suppliers; further, as most of the creameries in the Union are more or less connected with the farmers themselves, and as most of the various boards of directors are composed of farmers, it cannot be imagined that they would intentionally try to injure one another. But this discontent amongst the suppliers is yearly on the increase, and unless a better spirit of co-operation is brought about the development of our dairy industry will be jeopardized.

3. *Export of Butter.*—During the year 49,216 cases of butter, equivalent to 2,766,096 lb., were exported to London, and throughout the period that exportation took place everything pointed to a good export season, but for reasons given above it was brought to an abrupt close. Unfortunately, the majority of the butter exported landed in London just at the time when the accumulated war stocks were being disposed of, consequently the market was very depressed and great difficulty was experienced in disposing of the butter at anything like remunerative prices. One of the greatest drawbacks to the establishment of an export trade is the inability of creameries to maintain a steady supply, and oversea buyers are never certain when the next consignment of South African butter is coming forward. Under our present state of development this is to a large extent unavoidable, but if the five or six million pounds of butter produced by individual effort in the Union, and mostly sold at very unremunerative prices, were converted into an export butter through co-operative action the position of our export trade would improve enormously.

Attention is drawn to the following principal faults observed in the grading of most of the butter for export this season:—(1) Unsuitability of boxes for export; (2) unsuitable grease-proof lining for same; and (3) short weights.

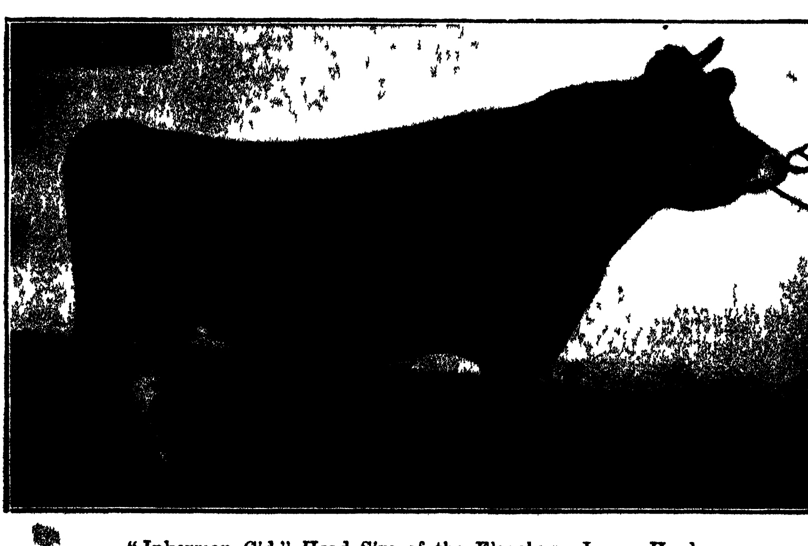
These faults, and their remedy, rest with the creameries themselves, but with future consignments of butter for export considerably more stringent action will be taken by the graders where such faults are observed. For example, many cases of butter (which, according to our export conditions, must contain 56 lb. net on arrival in London, an allowance having to be made of half to three-quarter lb. per case for shrinkage), have been found to contain only 54 lb. net, and in one or two isolated cases even less. This shows gross mismanagement and carelessness on the part of the creamery employee responsible for the packing. In issuing the certificate stating the net weight of each consignment it is quite impossible for the grader to weigh every case. In any case this certificate of weight is not final on the oversea markets, in view of the "Foreign Produce Exchange" rules regarding landed terms of butter sales, which clearly lay down that packages containing net weight of more than 30 lb., and up to 60 lb., are to be weighed within half a pound, or, in other words, all boxes of butter must weigh 56½ lb. *net.* It is hoped that in future creameries will give serious attention to these points.

4. *Cheese-making Industry.*—The output of cheese during the year amounted to 5,337,263 lb., of which approximately 149,200 lb. only were exported, the prices oversea not being considered sufficiently remunerative. Although production has been fairly good, there is far too great a percentage of indifferent cheese. The primary cause of this, in most instances, is lack of experience on the part of cheese-makers; in many cases also a cheese-maker who does know his work leaves it to the native attendants, often at the most critical stages

of cheese-making, and with disastrous results when the grading of such cheese takes place. There are times also when milk suppliers have been very careless in the handling of their milk prior to its arrival at the factory, but this only accounts for a small percentage of the bad cheese made, and as a general rule the cheese-maker himself is the greatest culprit. Many cheese factories have recently closed down owing to lack of support by their suppliers and the unmarketable nature of the cheese produced. Good cheese will always find a market, but the inferior article gluts the market and reduces the price of well-made cheese. If a system of payment were inaugurated whereby cheese-makers had their salaries reduced according to the percentage of bad cheese made, and received a bonus for all first-grade cheese produced at a factory, the unsatisfactory state of affairs at present existing might materially be minimized.

5. *General.*—Milk recording work is still on the increase, but there are several knotty points which will have to be taken into consideration in the near future. If anything is necessary to confirm the importance and necessity for keeping proper official milk records one has only to look back at the magnificent results of the Friesland Breeders' Association sale in England, which would never have taken place if a proper system of milk records had not been in force.

The administration of the Dairy Industry Act has taken up a good deal of the time of the officers of this Division. Further experience shows that certain additions to the Act will need to be made.



"Inkerman Cid," Head Sire of the Elsenburg Jersey Herd.

Report No. VIII.

CHEMISTRY.

Chief of Division: CHAS. F. JURITZ, M.A., D.Sc., F.I.C.

1. *Organization*.—The most important function of the year has been that of laying foundations for the closer co-operation of the sections of the Division located in various parts of the Union. This cannot be achieved all at once, but a few select phases of work will be brought into line step by step. Some of these will be enumerated later on. The guiding principle has been the resolution adopted at a conference called by the Secretary for Agriculture of heads of divisions and principals of agricultural schools (shortly before the twelve months under report), viz., that the control and guidance of research work should be vested in the chiefs of divisions, and that the services of the technical officers (i.e. in this case the chemists) at the schools should be utilized to the greatest extent possible to assist the heads of divisions. The relations between the chemists at the schools and the Chief of the Division in regard to research work would therefore rest upon the basic principle that the former should act in a directive capacity, in consultation with the principal of the school concerned, in respect of any work to be carried out by any particular chemist.

At Grootfontein the Division has in Mr. A. Stead an officer of its own: he advises the principal on matters pertaining to the school's chemical section, and in return the school laboratories are at his disposal for the purposes of the Division. On the other hand, the chemist belonging to the school staff assists in the work of the Division as far as possible, subsidiarily to the exigencies of the school's own requirements. On this basis the relations between the various chemical laboratories of the Department have been made closer, but a further rapprochement will be needed before a coherent unit is evolved. Meanwhile, consolidation is being proceeded with first where most urgently needed.

The Pretoria laboratory is wholly under the control of the Division. A great deal of the work there carried on hitherto has consisted of soil investigation.

The greatest difficulty is in regard to research work. There the supervision of the Chief of the Division embraces the laboratories attached to the schools as well as those directly connected with the Division. The fullest and most willing co-operation from principals and chemists is given in the endeavours to bring about co-ordination, but development must not be forced. At present measures are taken continuously to inform each institution of the progress of research work at every one of the others. This makes for mutual interest and

solidarity of aim. Several problems have arisen and have been dealt with in a satisfactory and uniform manner, that previously would either have been disposed of as the individual institution first confronted therewith thought fit, or left in abeyance until a chemists' conference could consider it.

With the important matter of the agricultural soil survey of the Union little progress has been made. It is impossible for the Chief of the Division to give the survey the undivided attention which is essential, and Mr. Stead, Senior Chemist of the Division, who was placed in charge thereof, was prevented by other duties and prolonged illness from assuming that charge. The work will, it is confidently hoped, soon be commenced.

2. *Commission Work.*—During the year the Chief of the Division served on committees appointed to investigate the problems arising from the need of cheap industrial alcohol, and to inquire into the matter of the destruction of prickly-pear.

From October, 1920, until well into the year under report, Mr. Stead was virtually seconded for service as a member of the Drought Commission. The first-hand knowledge of the country and its problems and conditions gained in the course of this inquiry should prove of great value to the Division.

3. *Publications.*—The following papers by officers of the Division were published during the twelve months:—

A. Stead:

"The Value of the Paddock System," *Journ. Dept. Agric.*, Vol. III, No. 2, August, 1921, pp. 131-135.

B. J. Smit:

"Representative Transvaal Soils: The Norite Black Turf," *Journ. Dept. Agric.*, Vol. III, No. 4, October, 1921, pp. 337-342.

"The Uses of Tobacco Waste," *Journ. Dept. Agric.*, Vol IV, No. 3, March, 1922, pp. 267-271.

C. F. Juritz:

"The Nicotine-Content of South African Tobacco," *Journ. Dept. Agric.*, Vol. IV, No. 6, June, 1922, pp. 552-562.

"The Submarine Phosphates of the Agulhas Bank," *S.A. Journ. of Industries*, Vol. IV, No. 10, November, 1921, pp. 863-865.

"Bacterial Production of Motor Fuel," *S.A. Journ. of Industries*, Vol. IV, No. 11, December, 1921, pp. 905-910.

B. de C. Marchand:

"On the Volumetric Determination of Phosphoric Oxide," *S.A. Journ. of Science*, Vol. XVII, Nos. 3 and 4, July, 1921, pp. 259-268.

W. J. Copenhagen:

"Studying our Marine Resources," *S.A. Journ. of Industries*, Vol. V, No. 4, April, 1922, pp. 160-163.

EXTRACTS FROM THE REPORTS OF THE DIVISION'S OFFICERS IN CHARGE AT CAPETOWN, GROOTFONTEIN, AND PRETORIA.

1.—*Capetown*: Chief of the Division.

(*a*) *Analytical Work.*—During the year 477 samples of various kinds were analysed. Of these, the analyses of salt, brine, bittern, etc., were performed for the purpose of a general survey of the salt-pans of the Union; and an investigation into the nicotine-content of various types and qualities of tobacco grown in the Union was undertaken in connection with the production of a satisfactory tobacco extract. An analysis of ash from tobacco stems yielded 17·8 per cent. of potash.

With the exception of seventeen samples of guano and a few analyses of limestone, practically all the fertilizers analysed were in connection with the Fertilizers, Farm Foods, and Pest Remedies Act.

As usual several analyses of Government guano were made, and a series of comparative analyses of the produce of the different islands are also in progress. Limestone from Saldanha Bay crushed for use as agricultural lime was found to contain 36·3 per cent. of carbon dioxide, corresponding to 82·5 per cent. of calcium carbonate. Some limestones and supposed phosphatic deposits from Dassen Island were examined, but the results were not promising.

A special report on the subject of the change in the composition of basic slag was furnished, also one on the alleged poisonous character of basic slag and other fertilizers.

An investigation was commenced, and is being continued, in regard to the relation between the degree of ripeness of grapes and their sugar-content to their suitability for export.

A restricted amount only of soil investigation could be carried out. A sandy soil from the Caledon District was examined and found to be, as such soils usually are, indifferently supplied with humus, low in moisture-retaining power, and poor in plant-food. Two samples of virgin sandy loams from Klipheuvel were also deficient in organic matter, nitrogen, and water-retaining power as well as in organic plant-food. Some soils from a farm at De Doorns proved to be rather brak, containing about ·25 per cent. of sodium salts. A similar proportion was found in one out of three soils obtained from a farm in the irrigable area of the Olifants River, Van Rhynsdorp. A very brak soil from Middelburg, Transvaal, was examined. It contained ·56 per cent. of sodium salts. A deep virgin soil of good humus-content, rich in nitrogen and with a satisfactory moisture-retaining power was received from the Ceres District, but its supply of inorganic plant-food could only be described as moderate. Ten soils from the Cradock Division were examined in connection with the construction of an irrigation dam.

The occurrence of collar-rot in citrus trees in the Clanwilliam District led to an examination of the soil for brak salts and acidity. In neither respect was the salt in any way at fault. The use of liquid hydrocyanic acid for the destruction of pests on fruit trees led to an investigation of the character of the liquid commercially applied for the purpose and the mode of its manufacture.

The only sample of water that requires any special remark was one from Bellville, tested for salinity in connection with its proposed use in dairying. It contained 51·2 parts of dissolved salts per 100,000, consisting almost entirely of sodium chloride.

As to plant products, a sample of *senecio* from Newlands was examined in connection with its use as a poultry food. Some guinea grass from Somerset East was also analysed with a view to being utilized as fodder. Several plants were examined for their essential oil content, and the constants of those oils determined. Experiments were carried out to ascertain whether prickly-pear sections contain any saponin or pectin substances which could cause it to act as a "spreader" in insecticide washes, but nothing definite could be elicited. It was also sought to ascertain whether prickly-pear mucilage could partially replace gelatine if added when a solution of the latter was just below setting consistency. In this respect, too, the results were of a negative nature.

In connection with experiments at Elsenburg on feeding pigs with the residue of maize from which alcohol had been prepared and distilled off, analyses of mealie meal before and after treatment were carried out.

(*b*) *Toxicological Work.*—Occasional cases of supposed poisoning of stock were submitted for examination.

Several samples of strychnine were received at various times, with the complaint that they had been found ineffective for wild animal poisoning. In every case the article was found perfectly pure, and the fault must lie in the compounding of the bait.

The deposition of crystals in drums of concentrated sodium arsenite solution was inquired into, and attention given to the numerous untoward results of the careless or malicious use of the arsenicals employed in orchard spraying and stock dipping.

(*c*) *Microbiological Work.*—In connection with the commercial manufacture of acetone and alcohol from such cultures as maize or sweet potatoes, a bacillus capable of effecting the conversion of maize was obtained by the kindness of the Rockefeller Institute, and cultures were prepared for a large-scale production of these articles, but the plant was not located in a suitable environment and was subsequently broken up.

Pure cultures of certain soil organisms were procured from the Lister Institute, and sub-cultures of these were prepared and distributed amongst agriculturists for experimental purposes. Further samples of soil from different parts of the Union were sent to Rothamsted for the study of soil protozoa. Experiments in soil inoculation were initiated on several farms in the south-western districts.

(*d*) *Dairy Industry Act.*—Under the provisions of this Act all milk and cream testing appliances offered for sale within the Union have to be tested for accuracy of graduation and dimensions, and marked in a Government laboratory. This practice was continued, and 616 articles examined during the year. They comprised 447 Babcock cream bottles, 72 Babcock milk bottles, and 97 pipettes. Of these, 46·9 per cent. were rejected, viz., 50·1 per cent. of the cream-test bottles, 86·1 per cent. of the milk-test bottles, and 3·1 per cent. of the pipettes.

(*e*) *Consultation Work.*—On frequent occasions reports had to be furnished on miscellaneous abstract questions submitted for advice, such as the manuring of sandy grass lands, horns as a fertilizer, preservation of foodstuffs, etc.

2.—*Grootfontein*: A. Stead, B.Sc., F.C.S.

Most of the period was occupied by the officer in charge in serving as a member of the Drought Inquiry Commission or on leave of absence. Other work included the inspection of manurial experiments, of brak land at Uitenhage, of prickly-pear spraying tests, of brak in an orchard near Cradock, the compilation of a comprehensive report on brak for the Department of Mines and Industries (still in progress), investigation of the feeding of sheep on prickly-pear as the main portion of their diet, investigation of farmers' experience in the Graaff-Reinet District regarding the utilization of *Agave americana* as a stock food, experimental feeding of prickly-pear to cows and oxen, and continuation of sheep-feeding experiments.

In connection with the report on brak, referred to above, the methods adopted for reclaiming brak land near Robertson were inspected, and led to a recommendation that the Division of Chemistry should engage in such operations as, for instance, at Klipdrift, where the well-known efforts of the late Mr. J. P. Marais had failed.

A considerable amount of work of an advisory and consulting nature was also done.

3.—*Pretoria*: B. de C. Marchand, B.A., D.Sc.

(*a*) *Analytical Work.*—The samples received for analysis or examination comprised:—Soils and sub-soils, 146; fertilizers, 115; dairy products, 20; tobacco, 16; water, 15; miscellaneous, 69; total, 381. Of the soil samples, 54 were taken by officers of the Division in connection with investigational work. The only other soil samples which call for any comment were five sent in by the Postal Department in connection with the rapid corrosion of stay rods and plates. This was ascribed to alkaline salts in the soil. Preventive measures were suggested.

(*b*) *Dairy Glassware.*—The total number of pieces tested was 932, consisting of Babcock cream bottles 583, Babcock milk bottles 277, pipettes 72. The percentage rejected as incorrect was four.

(*c*) *Investigations.*—In addition to the continuation of others, investigations were commenced on the physical properties of soils, the influence of various factors on the citric solubility of the phosphoric oxide in basic slag, and the determination of "available" potash in soils.

The trials of various methods for the determination of phosphoric oxide in fertilizers were completed, and the results for the sample of basic slag experimented on were published in the *Journal of the South African Chemical Institute*, Vol. V, No. 1, p. 16.

(*d*) *Pot Experiments.*—In connection with certain of the investigations in hand, pot experiments on a small scale were commenced.

Report No. IX.

TOBACCO AND COTTON.

Chief of Division: W. H. SCHERFFIUS, M.Sc.

1. *Publications.*—In addition to articles in the *Journal*, a pamphlet, "Wild Fire and Angular Spot," was issued and a number of articles prepared for the agricultural press.

2. *Tobacco.*—The 1920-21 tobacco crop for the Union was 16,620,640 lb., as compared with 11,644,300 lb. the year previous. The price for the best grades remained fairly steady, but the lower grades suffered a heavy decline. This is attributable to various causes. The wet season during the curing period caused a large percentage of dark and low-grade leaf, and the general financial depression throughout the world caused a big decline generally in the prices of agricultural products. The excise tax, coming at this time, further tended to unsettle the market, but the relief measures adopted by the Government and the amended excise law should assist in restoring stability. The exports and imports of tobacco for 1921, not including Rhodesia, were respectively 641,825 and 356,286 lb. The Rustenburg and Parys tobacco societies were in a somewhat depressed condition for a while, but the relief measure referred to above, and later a slight improvement in the market, eased the situation. The Turkish Tobacco Society was in a much better position on account of the supply not being equal to the demand for this type of tobacco.

3. *Cotton.*—The cotton crop for the previous year amounted to 1,169,298 lb. of lint, thus maintaining the progressive annual increase since 1909. The 1922 crop, although showing a light yield per acre, will average out very well for the whole area planted, as fortunately there was a comparatively small amount of destruction by insects. The price of cotton steadily advanced till July, 1922, when it stood at about 13d. per lb., cash quotations on American middlings. With the alarming reports of a declining yield of American cotton, the opportunity of developing a big industry in this country is most encouraging. The Co-operative Cotton Growers' Exchange should be of mutual advantage to cotton growers in the disposal of their crop, as it is always advantageous to have for disposal a large parcel all of one grade.

4. *Pure Seed.*—The demand for improved cotton seed became so urgent and the necessity so apparent, that the Government decided to station a plant breeder at the Rustenburg Experiment Station to devote his time to this important work. Further, authority was received to increase the acreage of cotton lands. This was done, but the specialist was not secured, and this line of investigation did not make the progress hoped for.

5. *British Cotton Growing Association's Prizes.*—The second competition for the year 1920-21 was completed in so far as the Division was concerned, as the samples were sent to the Association some time ago to be judged. Arrangements are being made for the third competition to take place during the year 1922-23. The prizes offered

for the second competition were as follows:—(*a*) Best fifty or more acres of cotton, £100; second best, £50; third best, £25. (*b*) Best ten or more acres of cotton, but less than fifty acres, £50; second best, £25; third best, £12. 10s. For these competitions the officers of the Division measure the fields and rate them for the farm practice methods applied, and collect the weights of the crops. The question of quality is judged by the Association. The field work in connection with the second competition was heavy, but the encouragement given to the farmers and keen interest shown by them, it is considered, fully justify the extra labour involved.

6. *Agricultural Shows.*—The officers of the Division were in much demand as judges at the agricultural shows. An exhibit of tobacco and cotton and by-products was staged at all the principal shows.

7. *Experiment Station Work.*—Experiments were continued in connection with the improvement of types by plant selection and the propagation of individuals in comparative row tests; the improvement of commercial fields by the process of elimination; testing the relative merits of different distances of planting; comparison of varieties by planting in a series of plots; fertilizer and rotation experiments; testing the relative merits of the different methods of curing tobacco; comparing various methods of treating tobacco to produce the highest percentage of nicotine; and the production of other crops to improve the land and for use on the stations.

At the Rustenburg station the tobacco and cotton crops suffered to some extent on account of drought during January and February, but they recovered considerably when the rains set in. The tobacco fertilizer plots gave excellent results and proved to be the most satisfactory yet obtained. The tobacco flue-curing experiments gave excellent results. Very valuable work on cotton breeding was continued, but the whole attention of a qualified officer is necessary to get the best results. The students' hostel was full during the whole time. The apprentices acquitted themselves very creditably.

The work being done at Elsenburg in the development of improved types of tobacco will be of lasting benefit to the Turkish tobacco planters. The station has reached a stage in which it is supplying improved seed to all those requiring it. The popularity of these improved strains is apparent in the sales thereof: only a few ounces are sold to each farmer, yet the revenue from this source will, it is anticipated, amount to more than £100 in 1921-22.

At the Piet Retief station similar work to that of previous years was undertaken by the foreman, the new manager having arrived too late to conduct the operations in the beginning of the year. Much more satisfactory results may be anticipated in the future. Spraying experiments to control the tobacco beetle were continued last season, and this seems to be the only safe means of controlling this pest.

8. *Itinerant Work.*—The various itinerant officers of the Division gave series of lectures at the agricultural schools, and attended and lectured at farmers' meetings throughout the Union. The fibre expert had a heavy year's work visiting the various ginneries, first to classify the seed cotton as it came from the farmers and later grading a sample of the lint from each bale before it is shipped. There were 1666 bales of approximately 500 lb. each, which had to pass twice through his hands. In addition, he graded and reported on a great number of small samples sent in by farmers.

Report No. X.

HORTICULTURE.

Chief of Division: I. TRIBOLET.

1. *General.*—The Chief of the Division spends about half his time in visiting various parts of the fruit growing areas of the Union, interviewing inquirers regarding fruit-farming, attending fruit growers' meetings, arranging shipping matters, etc., and judging at agricultural shows; the rest of his time is spent in office, attending to correspondence, writing reports, etc.

In November, 1921, Mr. Nebelung, the citrus specialist, arrived from California, and took up his work with the Division. He has lost no time in becoming acquainted with local conditions in the various citrus districts of the Union. In the course of his several tours he has not only obtained knowledge regarding soil, temperature, rainfall and water supply, and, to a certain extent, the farmers occupying the land, but has also been able to impart valuable advice to numerous inquirers. This advice touched on methods of citrus culture that obviously needed remedying, such as, proper methods of nursery propagation, of planting, and of pruning young and old trees; the general care of the orchard in matters of irrigation and cultivation; and the correct picking of fruit in respect of the types of clippers and picking bags to be used, also the manner of handling.

The citrus expert, Mr. H. B. Anderson, arrived on contract from the United States in August, 1921, and did excellent work until May, 1922, when he had a severe attack of malaria, contracted in the north-eastern Transvaal. He died on the 10th of that month, much regretted by those with whom he had become acquainted in various parts of the citrus areas.

The itinerant horticulturist, Mr. Le Sueur, stationed at Port Elizabeth, in charge of the eastern Cape districts area, resigned from January, 1922. The Division is thus short of two very important officers. It is proposed to fill one of the vacant posts with one of the oversea students, due to return about November. On account of the big developments taking place in fruit growing in the eastern Cape Districts (Sunday's River, Fish River, Uitenhage, Gamtoos River, and elsewhere), a capable itinerant horticulturist is urgently needed for this part. An officer is also required to fill the late Mr. Anderson's post, as the citrus industry is making rapid progress, and one citrus specialist is totally unable to cope with the increasing work.

2. *Export Season* 1922: *Staff Arrangements.*—The Division was again unfortunate in regard to staff. Mr. Roworth, the inspector

at Capetown, has been on sick leave since the 23rd December, 1921. During the first two and a half months of his absence, the Chief of the Division took charge at the Docks at Capetown. Later, when the season had well started, Mr. Edmonds, the assistant, was put in charge, followed by Mr. Nebelung. The volume of export increased, however, to such an extent, that it was necessary to have further assistance, and Mr. R. Bulmer was appointed temporarily, on the 26th June, to take charge of the inspection work, and is still in office. It was also found necessary to appoint four temporary hands at various times, to assist in the inspection in order to keep pace with the large quantities of fruit being rushed forward for export. At Port Elizabeth, Mossel Bay, East London, and Durban, the inspection is conducted by officers not attached to the Division. These ports will in the near future require to be served by permanent trained men.

Owing to the slump in wine, many of the wine farmers, instead of pressing their grapes, converted a portion into dried grapes (raisins) for export to the United States. Some hundreds of tons of this product found their way to the docks for shipment overseas; as the dried grapes were shipped under Government Regulations, inspection had to be carried out, and temporary assistance had to be given.

3. *Organization of Fruit Growers.*—As predicted in the previous year's report, fruit growers have realized the necessity of co-operation, and after many meetings and a certain amount of propaganda work, have formed associations to guard their interests and get their products overseas in the best possible condition. The result of the movement was the establishment of a South African Fruit Exchange. It embodies various sections of the fruit growing interests in the form of divisions, such as a citrus division, a deciduous division, and a pineapple division. These divisions, looking after their own sectional interests, are represented on the Exchange. In general matters such as shipping, buying material, etc., the Exchange operates. The formation of the Exchange will no doubt relieve the Division of responsibility in various ways, and perhaps be more satisfactory to growers who join the movement.

4. *Deciduous Fruits.*—The export season opened on the 9th December, 1921, when the first shipment went forward. Climatic conditions during the time of export were rather unfavourable, especially towards the end of the season; grape growers suffered most, spasmodic showers and dull weather at about the ripening time accounting for a good deal of wastage. The varieties cropping heaviest were pears, grapes, and peaches; prunes were on the low side, and apricots moderate. Prices for good sound fruit ruled high throughout, especially for grapes. Although about 800,000 boxes of all fruits were shipped, better shipping conditions existed than last season. The Department is investigating the probable causes of wastage in export fruit, and no doubt valuable data will be obtained.

5. *Citrus Fruits.*—The 1922 export season started on the 20th May. About the commencement of the shipping season, heavy hailstorms swept over parts of the Rustenburg valley and other districts, doing considerable damage to the almost ripe fruit.

Despite a general tightening up of the Export Regulations, inferior fruit still seems to find its way overseas. This will never be overcome unless growers honestly co-operate with the Department and endeavour, under the instructions of its experts and inspectors, to ship fruit suitable for export. It has been stated in previous reports, and is again emphasized, that the proper place in which to grapple effectively with this problem is in the orange groves and district packing-houses.

The prices obtained have not been as high as during the years immediately after the war. This decline was expected, and will probably continue, yet a fair profit should be derived from the sale of oranges at from 16s. to 20s. overseas. It is very noticeable that short counts of large fruit do not realize by from 2s. to 3s. as much as the longer counts of small oranges. The shipping space arranged through the fruit exchange has been good, there being no serious delays at the ports as experienced last season, and from now on, shipping should be readily available to cope in a reasonable time with everything coming forward.

6. FRUIT SHIPPED FROM THE UNION.

(i) *Deciduous and others: Season*, 1921-22.

	Boxes.		Boxes
Apricots...	3,147	Pineapples	25,506
Peaches	106,556	Tomatoes	11
Plums	96,665	Pomegranates	178
Nectarines	19,547	Persimmons...	220
Pears	334,272	Avocado pears	141
Grapes	195,975	Quinces	316
Apples	6,644	Guavas	16
Melons	26,627	Unclassified	468
		Total	816,289

(ii) *Citrus: Year ended 30th June*, 1922.*

	Boxes.
Oranges	230,059
Naartjes	30,474
Grape Fruit	5,751
Total	266,284

7. *Dried Fruits.*—The regulations framed by the Department in conjunction with the principal growers and dealers in dried fruits in this country, do not, according to reports from overseas, appear to be effective. Many merchants and dealers overseas state that the grading is not sufficiently based on uniformity of quality, but rather on size, which, as in other fruits, is no warranty as to quality. Further amendments to the regulations will no doubt be effected, based on the overseas requirements, before next season.

* This includes the latter part of the 1921 season and the beginning of the 1922 season.

Report No. XI.

VITICULTURE.

Government Viticulturist: S. W. VAN NIEKERK.

1. *Oenological Institute.*—During the period under review a greater number of wines was analyzed and microscopically investigated than in any previous year. Fermentation experiments with imported as against Cape yeast were conducted, the results being published in the *Journal* of November, 1921. A large number of experiments in connection with moskonfyt boiling was also carried out. These experiments proved that to obtain the best results it is necessary, in the majority of must used for moskonfyt, to neutralize the must with calcium carbonate. Pure levures were again propagated and distributed among farmers.

2. *Short Course in Wine-Making.*—This course was again held in January. Twenty-seven farmers attended. Dr. Perold and Mr. Cuthbert, Assistant Chemist at Elsenburg, assisted. The course was given in both official languages, and several farmers who attended previously were again present.

3. *Outside Work.*—The Government Viticulturist is still responsible for the lectures at Elsenburg. The correspondence of the Division is steadily increasing. The requests to visit farms to give practical demonstrations, advice on soil, etc., continue to increase and very often applicants must either be refused or be kept waiting for a long time. Over ninety farms, however, were visited and twenty farmers' meetings attended. Two outside lectures on viticultural matters were given. On account of the bad condition of the wine trade, the making of moskonfyt was taken up in earnest; this branch was previously only a small side-line and never studied scientifically. Several meetings on this subject with those interested were held. At Villiersdorp the first registered moskonfyt factory in South Africa was established.

There was an unusual number of inquiries regarding the manipulation of wines and brandies and even liqueurs. This indicates that several farmers are considering the advisability of starting their own retail business, as they cannot make both ends meet with the present wholesale prices.

Inquiries regarding the best table grapes and their treatment were numerous. In many instances practical demonstrations in the trimming and thinning of grapes were requested and later in the packing for export. The Division was also approached in connection with the making of wines on farms, but as it was employed in this direction at the time at the Government Institutions, the service could not be undertaken.

4. *Paarl Viticultural Station.*—A résumé of the activities of this Station was published in the March, 1922, number of the *Journal*. As a result many inquiries were received regarding certain grape

varieties. Twenty-seven different varieties were exported to test their travelling qualities, and a full report was forwarded to the *Journal* (published September, 1922), with remarks concerning the growth, etc., of each variety. Dried currants were made from the Cape currant and the Zante currant, and a sample of each submitted to Mr. Cartwright, a recognized authority on dried fruits, who made the following remarks:—

> So far as the quality goes there is little to choose between them either in appearance or [flavour. The South African fruit is somewhat bolder, but either would be equally saleable. A few of the berries in the South African sample are unusually large from a confectioner's point of view, being almost as big as Sultanas, and these would be better eliminated.

Over a thousand boxes of grapes were sent to the Johannesburg market and realized satisfactory prices, averaging 3d. per lb. net. This proves that good fruit well packed can be sold at satisfactory prices on some of our local markets.

Large numbers of vine-cuttings were again distributed all over the Union. Grapes and wines were exhibited at the Paarl Agricultural Show, but owing to the manager being unwell the exhibition at Rosebank had to be cancelled.

The wines of the station were of good quality, and, although wine was generally almost unsaleable, were disposed of at the maximum price laid down by the Co-operative Wine Farmers' Association. Large numbers of the public visit the station from time to time to study the different varieties of grapes, systems of pruning, trellising, etc. The total revenue of the station was £388, and the expenditure £331, exclusive of manager's salary.

5. *Estimated Production.*—The 1922 crop is estimated not to exceed 105,000 leaguers as against 140,000 in 1921. This shortage can be attributed to a smaller crop all round and to the amount of raisins produced. A new feature last season was the turning of wine-grapes into raisins. The raisins made from wine-grapes are inferior to those made from recognized raisin grapes. These are exported to America, where the working classes consume large quantities of raisins if procurable at reasonable prices. Reports from America state that the raisins are fetching from 5d. to 7d. per lb. This leaves a small margin for the producer here, yet it pays better than making wine for £3 per leaguer. Of the estimated crop of 105,000 leaguers only 20,000 have actually been sold to the wine merchants; so that the rest will have to be declared surplus. The wine industry is at present in a very bad state indeed. There seems to be an optimistic feeling that next year there will be an improvement.

6. *Plantings.*—On account of the bad state of the wine market, plantings have not been very extensive with the wine-making varieties and especially the white varieties. Owing to rumours that there may be a demand for hermitage raisins in future this grape is still planted to a certain extent. Table grapes and especially export varieties, are still planted extensively. Grafted vines of these varieties fetched good prices and the market is practically empty, whereas many vines are still offered of the wine-making varieties.

7. *Export of Grapes.*—This branch of the industry is expanding rapidly. Judging by the amount of plantings it can confidently be stated that grape export is going to be a very big concern in the near future.

Report No. XII.

GOVERNMENT WINE FARM, CONSTANTIA.

Manager: A. G. VAN REENEN.

1. *Apprentices*.—During the period under review the full number of apprentices (sons of parents who cannot afford to send them to any of the Schools of Agriculture) was in residence. A good many applications for apprenticeship were received, and these boys will be taken on as vacancies occur. The general behaviour of the apprentices was good.

2. *Vintage*.—The vintage was a good one, the yields being as follows:—Sweet Constantia, 1915 gallons; Constantia Berg, 2020 gallons; Sauvignon Blanc, 3592 gallons; Hermitage-Malbec, 2230 gallons; Cabernet Sauvignon, 957 gallons; Pontac, 66 gallons; and Press, 2230 gallons—total, 13,010 gallons.

A large block of vineyard was uprooted, and 31,000 vines grafted on suitable stocks planted in its stead. In the year 1922-23 more will be uprooted, and the land prepared for replanting in the following season. Some of the old orchards were also uprooted and are being replanted.

3. *Experiments*.—Experiments are being carried out to find the most suitable American stocks for this district, as some varieties which do well in the drier districts, such as Stellenbosch, Paarl, Montagu, etc., are not suited to the Constantia area.

Owing to the wasty condition of grapes on arrival in Europe during the 1920-21 season, several varieties of table grapes were grafted on certain American stocks, by which it is hoped to better the ripening and colouring of the fruit, at the same time making it hardier without tending to coarseness. Manurial experiments are also being carried out with the same object in view.

Experiments are being conducted in conjunction with the Mycologist to test the different sprays for the control of Anthracnose and Peach Leaf Curl; also with the Chief Division of Chemistry in connection with bacteria in the soils for legumes.

Two large experiments in the manuring of vines are being carried out; these will be spread over a period of three or four years, the main object being to ascertain how much of each of the different plant-foods the vine actually requires to give the best yield of fruit, both for quality and quantity, while still retaining its vigour. Apparently there are no data of this description, except that from abroad, so that many people are fertilizing or manuring without knowing what quantities of plant-food their vines require.

Turkish tobacco was grown for instruction of the apprentices; a satisfactory crop of very good quality was reaped, although the weather conditions were not favourable in the early part of the season.

For the year ended 31st March, 1922, the total expenditure amounted to £3391, and the receipts to £1432. The latter is lower than expected, but owing to the state of the wine market no large sales were put through, so that the whole of the previous season's crop remained on hand at the end of the year.

Report No. XIII.

CO-OPERATION.

Registrar of Co-operative Agricultural Societies: JOHS. RETIEF.

1. *New Societies.*—Five new societies were registered—two in the Orange Free State and three in the Transvaal. Two of these deal with citrus, one supplies its members with dairy cattle, and two are tobacco societies.

2. *Removal of Societies from Register.*—Two societies were removed from the Register of Co-operative Agricultural Societies during the year, viz., Pretoria Landbouw Ko-operatieve Vereniging and Dewetsdorp Ko-operatieve Landbouw Vereniging. Both were general produce societies. The first-named society was formed in 1913, and has not, as stated in the previous Report, at any period of its existence been able to make any headway. The dissolution of the society, however, involved no loss to its members; on the contrary it was in a position to pay out a small dividend. The Dewetsdorp society was registered in 1920, and dealt mostly with wool. It was put into liquidation, as the members decided to transfer the business to a larger institution.

3. *The Number of Active Societies* is forty-five, as shown in the following table:—

	Produce and Implements.	Cheese Factories.	Dairy Cattle.	Thrashing.	Tobacco.	Citrus.	Total.
Transvaal ...	14	—	2	1	2	4	23
Orange Free State ...	13	1	7	—	1		22
				TOTAL			45

4. *The Turnover of Societies* is shown as under:—

	Maize Sold. Bags.	Tobacco Sold. lb.	Other Produce Sold. Value.	Farming Requisites Sold. Value.
1920 ...	532,474	3,794,662	£166,430	£288,939
1921 ...	1,645,836	3,844,493	£267,648	£180,303

The actual number of bags of maize received from members during the 1920 reaping season was 181,300 more than in the following season (1,502,735 against 1,321,427 bags). The quantity sold during the calendar year 1920 was considerably less than in 1921, as the societies had exceptionally large stocks on hand at 31st December, 1920. The turnover in tobacco continues to increase, 1,048,852 lb. more were sold in 1921 than in 1919, and 2,309,872 lb. more than in 1918. The Magaliesberg Ko-operatieve Tabakplanters Vereniging received from its members during the 1921-22 season 6,553,710 lb. of tobacco. The turnover in implements, etc., was less in 1921 than in the previous year, owing partly to the depression in the produce market and partly to societies having restricted the credit granted to their members.

5. *Membership.*—At 30th June, 1922, the total membership of the societies in active operation was 12,554, as compared with 11,893 the previous year. Additions to membership during the year under review were 1382, and withdrawals 721, the latter being made up of: resignations, 484; deaths, 50; expulsions, 53; and two societies dissolved, 134.

6. *Progress made by Societies.*—The subjoined statement shows the financial position of the individual societies. The information given has reference, in the majority of cases, to the financial year 1920-21 which in the case of nearly all the societies ends on 31st May.

(*a*) *Maize.*—With one exception, all the maize societies advanced more on the maize received by them during the 1920-21 season than the maize actually realized, the total amount so over-advanced being about £350,000. In terms of the regulations, the amounts over-advanced must be repaid by the members who received them, and although the Land Bank allowed a period of five years for the repayment of the amount involved, the financial position of nearly all the maize societies was considerably weakened. The large amounts outstanding on members' accounts in respect of farming requisites was always a serious handicap to the progress of the majority of the older societies. It is regretted that these outstandings have greatly increased as a result of the excessive credit granted against the surplus members were expected to receive on their maize at the end of the season, i.e. the price realized over and above the advance made at the commencement of the season. In the case of one society alone, where, through hard work and considerable expense both to the society and this Division, the outstandings among members in respect of farming requisites were reduced to a little over £12,000, the credit against the expected surplus given during one season (1920-21) increased these outstanding again to nearly £44.000. As the over-advances made by the society during the same season amounted to £46,700, the total amount owing by members was about £91,000.

The credit system, as is well known, was the main cause of all the failures in the past. It weakens the society financially on account of the bad debts incurred; it causes members who are in need of cash, after reaping, to sell their produce outside the society upon finding that the advances due to them are being withheld in payment of their accounts; and it further retards the progress of the society

and of the whole movement, because many growers are reluctant to become members of an organization with large outstandings. The essentials for putting the societies on a permanent sound footing are, apart from good management, the adoption of a cash system without any credits based on an expected surplus at the end of the season, and giving advances sufficiently low to allow of the distribution of such surpluses. Only by working on these lines can success be expected in connection with the proposed scheme by which all maize growers in the country should pool their maize.

(*b*) *Tobacco.*—The Magaliesberg society had another successful year, and has extended the sphere of its operations to the Marico District. It was able to add a further £3558 to its reserve fund, which now stands at £41,476. The Vaal River society commenced operations during the year, while another tobacco society was formed at Pietersburg.

Now that the new Co-operative Societies Act is in force, it should be possible to form co-operative tobacco associations in those centres of the Union where up to the present it has not been practicable to do so, as it would have been difficult to work successfully without a central organization to control the sales of tobacco, etc.

(*c*) *Thrashing.*—While a few of the maize societies are carrying on thrashing operations in addition to other business, only one society has so far been formed exclusively for this purpose, namely the Olifantsrivier Co-operatieve Dorschwerk.

(*d*) *Dairy Cattle Societies.*—As explained in previous reports, these societies are intended to encourage the dairy industry by enabling members to obtain thoroughbred cattle of good milk-producing strain on advantageous terms. These societies are of great benefit to the members, and should serve the advancement of the dairy industry of the country.

(*e*) *Cotton.*—The Rustenburg Boeren Ko-operatieve Vereniging was, during the period under review, still the only society handling cotton. Several meetings were held, however, by representatives of the cotton-growing districts in the Transvaal and Natal, with a view to organizing the cotton growers and establishing co-operative associations in all suitable centres, including Swaziland.

(*f*) *Citrus.*—During the period under review two further citrus societies were registered under the Transvaal Co-operative Act. With a view to co-ordinating individual effort in order more effectively to reach the market, representatives of nearly all the fruit-growing districts in the Union held a meeting in Johannesburg towards the end of 1921, the outcome of which was the formation of a Fruit Exchange for the whole Union. The Exchange was registered in due course under the Transvaal Companies Act, with articles which embodied the co-operative principles laid down in the Co-operative Bill. In the meantime propaganda was conducted for the formation of co-operative fruit societies and companies in the fruit-growing districts. The idea was that individual growers should be organized into local societies or companies, which were to link up through district exchanges, the latter joining the Fruit Exchange. The Fruit Exchange has had to contend with certain difficulties, arising chiefly

from the fact that it was not from the commencement built up by district exchanges, consisting of local associations. It is, however, hoped that all the difficulties so far encountered will be overcome in time, and that there will be joint action on the part of all fruit growers to put their business on a proper, organized basis.

7. *Extension of Movement.*—During the period under review the following new societies were registered: De Vaal Rivier Ko-operatieve Tabak Boeren Vereniging, De Kaffer Rivier Ko-operatieve Stud Schaap Vereniging, De Kaap Co-operative Citrus Society, Marico Ko-operatieve Citrus Vereniging, Pietersburg Ko-operatieve Tabak en Tarwe Vereniging. This brings the total number of active societies registered at 30th June, 1922, under the Transvaal and Orange Free State Co-operative Acts, to forty-five, and marks the close of the period of co-operative extension under those Acts. The new Co-operative Societies Act repeals all former co-operative legislation, and the future development of the movement will take place under the new Act.

Farmers are to-day realizing more than ever that, in order to receive a reasonable return for their investment of capital and labour, they must resort not only to scientific methods of production and labour, but also find the shortest route between producer and consumer. Finding that individual efforts are of little avail against the forces opposing them, farmers are beginning to see that their only hope of success lies in co-operative effort, each helping the other, and all working together. That they have become imbued with this co-operative spirit is evidenced by the numerous co-operative organizations which, through voluntary effort, have recently come into existence in the Union or which are in course of formation.

Owing to the non-existence of a uniform law for the whole Union, expansion of the co-operative movement has hitherto been retarded, as it was impossible for co-operative associations, registered under the Companies Acts, to become affiliated to and join forces with the associations registered under the co-operative laws. Under the Co-operative Societies Act passed by Parliament last Session, this obstacle is removed, and we can look forward to that combination of forces among the different co-operative associations in the Union which must be the ultimate goal aimed at, and which all genuine co-operators have in view to-day.

POSITION OF INDIVIDUAL SOCIETIES.

Name of Society.	Turnover, 1/1/21–31/12/21.		Balance-Sheets.						Date of Balance-Sheets.	Remarks.
			Liabilities.			Assets.				
	Produce.	Farming Requisites.	Loans.	Sundry Creditors.	Reserve Funds.	Property, Plant, and Shares.	Stock and Cash.	Sundry Debtors.		
	£	£	£	£	£	£	£	£		
Bethlehem	38,822	5,254	22,112	1,762	831	4,162	2,755	17,788	31/5/21	This new Society is making progress, despite the position created by the over-advances on maize.
Centraal-Westelijke	120,181	24,765	103,635	176,237	11,845	12,384	12,418	266,915	31/5/21	A very large and influential Society. Is well managed, but the over-advances on maize was a blow from which it will take some years to recover. The sundry debtors and creditors items do not show the net position, owing to the maize pool only having been closed off after the end of the financial year.
Clocolan	11,598	1,981	19,762	236	93	1,846	233	18,012	31/5/21	This Society started operations at a very difficult time (season 1919–20), but, on the whole the over-advances on maize were less than the average.
Excelsior	1,449	—	9,945	62	43	1,474	1,115	7,461	31/5/21	Owing to delay in erecting a produce store, and to management troubles, the Society has not done business to any extent.
Edenburg	9,350	—	—	25	17	10	—	32	30/6/21	This new Society has as yet done business in a small way only.
Ermelo	33,830	9,495	22,370	7,052	7,864	12,927	4,995	19,364	31/12/21	This is one of the few Societies which did not pay out too high an advance on maize. The financial position is still sound, but the butchery branch recently established is not being conducted on profitable lines, and it appears to be a grave menace to the continued prosperity of the Society.
Ermelo Butchery	—	—	—	6,108	—	1,504	805	3,799	31/12/21	
Ficksburg	53,130	6,800	22,283	3,133	36	5,476	8,838	11,138	31/5/21	A Society established in 1920. It has gained very considerably in membership, and is doing an extensive business. It appears to be well managed.
Carried forward...£	268,360	48,295	200,107	194,615	20,729	39,783	31,159	344,509		

POSITION OF INDIVIDUAL SOCIETIES—(*continued*).

Name of Society.	Turnover, 1/1/21–31/12/21.		Balance-Sheets.						Date of Balance-Sheets.	Remarks.
			Liabilities.			Assets.				
	Produce.	Farming Requisites.	Loans.	Sundry Creditors.	Reserve Funds.	Property, Plant, and Shares.	Stock and Cash	Sundry Debtors.		
	£	£	£	£	£	£	£	£		
Brought forward...	268,360	48,295	200,107	194,615	26,729	39,783	31,159	344,509		
Frankfort..............	64,273	9,856	34,968	3,967	2,866	5,420	9,223	27,158	31/5/21	This Society is well managed, and has a strong membership. The district is good, and the management of the Society is optimistic in regard to its future.
Heidelberg.............	11,925	3,534	7,245	464	1,880	3,189	1,118	5,282	31/5/21	This Society is now well managed. The business does not command the confidence of the farmers in the district, but the position in this respect is improving considerably.
Heilbron...............	44,303	8,183	36,478	729	679	6,832	10,699	20,355	31/5/21	This is a new Society, with very good prospects. Its turnover will probably be exceptionally large, despite the hardship of the over-advances made in its first season.
Hobhouse.............	—	—	—	—	—	—	—	—	—	Financial statements not yet received. The liquidation of this small Society is probable, as forecasted in my last report.
Hoogeveld-Eendracht....	24,227	2,942	30,000	40	7,081	8,531	5,587	23,003	31/5/21	This Society has been in an unsatisfactory position for years, and the position brought about by the over-advances has now made reconstruction necessary. The Land Bank has made a call of £25 on each member.
Koster.................	25,770	4,150	26,000	2,467	3,025	1,495	4,047	25,950	30/6/21	This Society continues to be carefully managed.
Ladybrand..........	28,394	3,340	25,037	1,012	165	3,048	5,391	17,805	31/5/21	Disloyalty of members is greatly handicapping this Society, and as a result its future is not promising.
Lichtenburg.........	84,407	19,990	110,266	128,778	11,239	12,246	9,943	228,094	31/5/21	Over-advances on produce and excessive credit granted to members when produce prices were high have greatly weakened the position of this very large Society. The sundry debtors and creditors items do not indicate the true position owing to the fact that the Maize Pool had not been closed off at 31/5/21.
Carried forward...£	551,659	100,290	470,101	332,102	47,664	80,544	77,167	692,156		

POSITION OF INDIVIDUAL SOCIETIES—(*continued*).

Name of Society.	Turnover, 1/1/21–31/12/21.		Balance-Sheets.						Date of Balance-Sheets.	Remarks.
			Liabilities.			Assets.				
	Produce.	Farming Requisites.	Loans.	Sundry Creditors.	Reserve Funds.	Property, Plant, and Shares.	Stock and Cash.	Sundry Debtors.		
	£	£	£	£	£	£	£	£		
Brought forward...	551,659	100,290	470,101	332.102	47.664	80.544	77.167	692,156		
Lindley Boeren..........	57,820	8,107	38,995	8,348	2.081	9.579	17,813	22.032	31/5/21	This Society is well managed, and is doing good work.
Lydenburg..............	80,000	7,500	—	9,222	18,403	1.367	11.143	15.115	31/5/21	This Society continues thoroughly successful, and its financial position is all that can be desired.
Magaliesberg............	131,603	—	49,250	31,242	41,476	31.188	88.495	2,285	28/2/22	This successful and powerful Tobacco Society has added £3,558 to its Reserve Fund, which now stands at £41,476. The membership is 3,276.
Marico..................	731	898	2,849	875	83	553	438	2.816	30/6/21	This Society has not as yet been liquidated, despite the urgent and repeated representations of this office. Its continued existence is not justified by the business done. and is considered likely to involve the members in further losses.
Middelburg Landbouwers.	43,089	7,986	47,800	735	4,512	5,817	4.518	42,712	30/6/21	The position of this Society is not satisfactory, and it will need very careful management if it is to survive the position brought about by the over-advances on maize.
Olifantsrivier Dorschwerk.	—	—	456	200	1,706	942	15	1,405	31/12/21	The financial position of this Society is satisfactory, but the business is not conducted as energetically as it might be.
Reitz..................	113 895	2,152	65,629	5,064	1,282	10.448	46.366	15.161	31/5/21	This Society deals with very large quantities of maize, although it was only registered in 1919. Its future is hopeful.
Rustenburg Boeren......	12,457	2,153	24.960	16,711	3,296	7,069	30.994	6.904	31/1/22	This Society deals mostly in cotton. It is making very little progress, and a reorganization has been decided upon.
Carried forward...£	991,454	129,086	700,040	404,499	120,503	147.507	276.949	800.586		

POSITION OF INDIVIDUAL SOCIETIES—(*continued*).

Name of Society.	Turnover, 1/1/21–31/12/21.		Balance-Sheets.						Date of Balance-Sheets.	Remarks.
			Liabilities.			Assets.				
	Produce.	Farming Requisites.	Loans.	Sundry Creditors.	Reserve Funds.	Property, Plant, and Shares.	Stock and Cash.	Sundry Debtors.		
	£	£	£	£	£	£	£	£		
Brought forward...	991,454	129,086	706,040	404,499	120,503	147,507	276,949	800,586		
Rustenburg Citrus.......	13,589	4,724	1,034	182	792	1,046	447	515	31/12/21	This Society has again made a profit. It is doing good work.
Senekal........	49,527	2,385	43,726	1,323	1,392	5,963	8	40,470	31/5/21	This Society dealt with a greatly increased quantity of maize during the year. Heavy losses can be expected in connection with the over-advances on maize, but, with careful management, it should survive the position created by these over-advances.
Standerton..........	69,300	15,248	56,565	2,141	5,855	11,717	11,568	41,276	31/5/21	Since the date of the balance-sheet, circumstances have come to light which made it doubtful whether this Society will survive. The grossest mismanagement has occurred.
Vrede.......	57,394	8,714	44,960	4,923	7,959	8,447	3,611	45,784	31/5/21	The position of this Society is unsatisfactory, owing largely to over-advances on maize and excessive credit given to members when produce prices were high.
Waterberg.........	7,056	2,696	9,474	3,013	955	2,120	5,162	6,160	31/7/21	The steady progress which this Society made for some years after the reorganization, which was effected in 1916, has not been maintained.
Wepener..............	33,474	6,800	23,988	635	335	4,513	4,721	15,724	30/6/21	The reorganization of this Society referred to in last year's report did not have an immediate effect on the financial position. The year's working resulted in a loss of £356. 10s.
White River.........	—	2,350	447	1,206	190	1,551	218	74	31/3/22	This Society is for the present confining its attention to the supply to members of farming requisites.
Carried forward...£	1,221,594	172,003	880,234	417,922	137,981	182,864	302,684	950,589		

POSITION OF INDIVIDUAL SOCIETIES—(*continued*).

Name of Society	Turnover, 1/1/21–31/12/21.		Balance-Sheets.						Date of Balance-Sheets.	Remarks.
			Liabilities.			Assets.				
	Produce.	Farming Requisites.	Loans.	Sundry Creditors.	Reserve Funds	Property, Plant, and Shares.	Stock and Cash.	Sundry Debtors.		
	£	£	£	£	£	£	£	£		
Brought forward...	1,221,594	172,003	880,234	417,922	137,981	182,864	302,684	950,589		
Wolmaransstad.........	25,944	8,302	40,832	739	10,973	7,156	3,958	41,430	31/5/21	Over-advances on produce and excessive credit granted to members have greatly weakened the position of this Society.
Kestell Vee............	—	—	1,575	20	2	—	22	1,575	31/8/21	The object of these Societies is to develop the dairy industry. With the exception of Kopjes Society, they have up to the present confined their activities solely to supplying members with bulls and cows of good milk-producing breeds. They have been of great benefit to their members.
Kopjes...............	—	—	1,696	335	163	—	26	2,168	31/8/21	
Lindley Vee............	—	—	1,021	91	13	—	—	1,125	30/9/21	
Middelburg Vee.........	—	—	2,892	1	38	—	550	2,381	30/9/21	
Tonteldoos Vee..........	—	—	1,872	5	8	—	30	1,855	30/9/21	
Unie Vee..............	—	—	2,328	5	77	—	—	2,410	30/9/21	
Valsch River Cattle and Dairy................	—	—	1,647	52	36	—	—	1,735	31/8/21	
Aasvogelkrans...........	—	—	953	—	—	—	—	953	31/8/21	
Vaal Rivier Tabak Boeren	—	—	—	—	—	—	—	—	—	No financial statements have as yet been received from these new Societies.
Kaffir Rivier Stud Schaap	—	—	—	—	—	—	—	—	—	
De Kaap Citrus........	—	—	—	—	—	—	—	—	—	
Marico Citrus...........	—	—	—	—	—	—	—	—	—	
Pietersburg Tabak en Tarwe...............	—	—	—	—	—	—	—	—	—	
£	1,247,538	180,305	935,050	419,170	149,291	190,020	307,270	1,006,221		

Report No. XIV.

AGRONOMY, INCLUDING DRY-FARMING.

Government Agronomist: H. S. DU TOIT.

1. *General.*—The Division's activities in agronomical itinerant-extension, co-operative experiment and organization work are carried out in various parts of the Union. Assistance is also given (mostly by letter and seed parcel post) to farmers seeking advice outside the Union.

2. *Co-operative Experiments.*—The fast growing spirit of co-operation among the farmers of the Union has again manifested itself in the vastly increased numbers of applicants for seed, and also in the greater number of agriculturists who sought advice. During the period under review 95,714 lb. of different varieties of the most suitable seeds were issued to 714 farmers in 151 districts of the Union on the co-operative system. Owing to the increased demand for seed, the financial depression of the country and the shortage of funds on our Departmental Seed Vote, a great number of applications for seed could not be acceded to.

3. *Pietersburg Experiment Station.*—Many wheat varieties were planted during the season, but unfortunately all were very severely damaged by a terrific hail-storm on the 17th October, 1921.

Great Scott Wheat.—Owing to this particular wheat proving to be rust-resistant, a quantity of seed was obtained and distributed for experimental purposes.

Grasses.—In March, 1921, the following varieties were planted in small plots:—Pennisetum, Rhodes Grass, Phalaris Bulbosa, Star Grass, two varieties of Buffel Grass, Blue Grama, New South Wales Blue Grass, Side Oats, and Grama. Pennisetum, Buffel Grass, and Rhodes Grass gave the best results. Molasses Grass was planted in December last and has up to the present been very disappointing, giving very poor growth. It was nipped by frost during the early part of June.

Maize.—The following varieties were planted:—Leguna, Sahara Yellow, Hickory King, Wills Gehu, Oil Dent, Silver King, Golden Nugget, Rhode Island, White Flint, Natal 8-row Flint, and Minnesota 133. The most drought resistant of these varieties were:—Leguna, Sahara Yellow, Oil Dent, and Natal 8-row, with yields of 12½, 10½, 6, and 6 bags per acre respectively. The season was

exceptionally dry during the whole growing period of the maize crop. The drought was so severe during the flowering and cobbing stages of the crops that a number of varieties succumbed altogether, and while Sahara Yellow resisted the drought splendidly and gave its usual average yield, it would appear that it has found a superior in Leguna (a recently imported White Dent), which is a vigorous grower, drought-resister, and good yielder.

Mangels.—Mammoth Long Red did very well, some roots weighing up to 25 lb. each.

Millets.—Boer Manna, Broom-corn-millet, Proso millet, and Japanese Barnyard were planted. Broom-corn-millet again gave the best results in grain, hay, and feeding value.

Minnesota Black Amber Cane.—Two acres of this crop were made into stack silage, which proved excellent. This cane is considered very suitable for the drier parts as an ensilage crop.

Beans.—Fifty varieties were planted. The Bomba and Flageolet, two white varieties, did best.

Sorghums and Kaffir Corn.—Twenty varieties were planted, but owing to the ravages of grubs and aphis the results were poor.

Spineless Cactus.—Among the fourteen varieties experimented with, the following gave the best results:—Fusicaulis, Morado, Trabutt's Algerian, and Miskatel.

Trees.—The dry-land mixed fruit and forest trees continue to do very well, and also some fodder shrubs, of which Gacia (*Cytissus stenopetalus*), some of the salt bushes, and Gemsbok bean do exceptionally well.

Barley.—The new 6-row (Mariout) malting variety, of which mention was made in the previous report, has again done very well as a summer crop, and the farmer co-operative experimentalists all report very favourably on this variety.

Rye.—This cereal is still receiving special attention, and some progress has been made towards gaining the object aimed at—the consumption of rye bread in South Africa, as explained in the previous report.

Peanuts.—Resulting from many years of study and experiment in the cultivation of peanuts, it can now definitely be stated that this crop is not only profitable, but is also a comparatively *safe* crop, especially in the summer rainfall areas of the Union. Hundreds of bags of seed have been distributed to many farmers with most gratifying results. The peanut has developed into a new South African industry and deserves every encouragement, especially in reduced railway rates and ship's freights.

A peanut by-product and nut-butter factory has been established at Duivelskloof, Northern Transvaal, and a strong company has been formed with the object of erecting a large oil-expressing plant at Pietersburg, Transvaal, and exporting nut oil to England and Continental Europe, where there is an unlimited demand for this commodity.

Report No. XV.

GOVERNMENT GUANO ISLANDS.

Superintendent: W. R. ZEEDERBERG.

1. *Production of Guano.*—The steady increase in the production of guano, noted in preceding reports, was maintained, and had it not been for the losses sustained during the latter part of the breeding season 1920-21, through the action of the very heavy rains which fell on the coast in January and February, the output for 1921, if it did not actually exceed it, would not have been very far short of that of the previous year. Notwithstanding this, however, the total collections amounted to approximately 8500 tons, of which 3274¾ tons were obtained from the Colonial Islands, and 5225¼ tons from the Northern Group.

The following return shows the yield of guano and the quantities actually brought up to Capetown during the year 1921, as compared with the previous year:—

Island.	Collected.		Shipped to Capetown.	
	1920.	1921.	1920.	1921.
Colonial Group.	Tons.	Tons.	Tons.	Tons.
Malagas Island	1,186¾	981	1,342½	981
Dassen Island	939¼	716½	939¼	716½
Jutten Island	524	552¾	536	552¾
Lamberts Bay Islet	336¾	362	336¾	362
Bird Island...	389½	*262¾	389½	375¾
Dyers Island	316	146	316	146
Paternoster Island	74	84½	72½	74
Marcus Island	Nil	54	—	54
Seal (False Bay) Island	34¼	45½	—	79¾
Elephant Rock	36	36¾	36	36¾
Foundlings Island	169½	33	169½	33
Total	4,606	3,274¾	4,138	3,411½
Northern Group.				
Sinclairs Island	138	87¾	142	138
Ichaboe Island	2,663½	2,606½	2,744¾	2,991¾
Possession Island	1,729¾	1,358*	1,571¾	1,120½
Halifax Island	603	456	450	603
Mercury Island	300	310	300	310
Penguin and Seal Islands	545½	220	545½	220
Pomona Island	165¾	130	165	130
Plumpudding Island	88	57	83	88
Hollamsbird Island	206	—	206	—
Total	6,439½	5,225¼	6,208¾	5,601¼
Grand Total	10,445½	8,500	10,346¾	9,012¾

* Roughly Estimated.

The reserve stock of guano (being the balance left over of the 1921 crop) on hand on the 31st December, 1921, was approximately 5280¾ tons, of which quantity about 1911½ tons were still remaining on certain of the islands on that date. The whole of this quantity, with the exception of roughly 27 tons on Bird Island and about 35 tons on Possession Island, was brought up to Capetown and disposed of in the first allotment in 1922.

2. *Allotment and Sale of Guano.*—The total quantity of guano disposed of throughout the Union between 1st July, 1921, and 30th June, 1922, was 9141¾ tons, of which 9118¾ tons were sold by allotment and 23 tons through the medium of the Knysna depot. Two allotments were made during this period, viz., one in July, 1921 (being the second for that year), in connection with which 1778¾ tons were distributed, and the other in February, 1922, when a further 7340 tons were allocated amongst the successful applicants.

3. *Demand for Guano.*—Notwithstanding the reduction in the selling price of guano from £10 to £8 per ton in November, 1921, there was a decided falling off both in the number of applications received and the quantities applied for in connection with the allotments this year. This may be only a temporary phase, attributable no doubt to the prevailing financial depression, but there is reason to believe that the general reduction in the prices of other fertilizers has also, to some extent, affected the demand for the Government article, which, nevertheless, still remains considerably in excess of the supplies available from time to time.

4. *Distribution of Guano*, 1921.—The total quantity of guano applied for during 1921 (including applications from other Government departments) was 28,145½ tons, and the quantity actually disposed of in the same period was 9423½ tons, 92·6 per cent. of which was absorbed by the western and south-western districts of the Cape Province; of that quantity 7069½ tons were distributed between the Malmesbury, Paarl, Cape, Stellenbosch, and Caledon divisions alone.

The following statement shows the quantities sold and distributed during 1921, as compared with 1920:—

SUMMARY OF DISTRIBUTION.

	1920. Tons.	1921. Tons.
Cape Province—		
Western and south-western districts ...	8053	8724½
Other districts	120¾	123¾
Transvaal (all districts)	256½	418
Natal (all districts)	92½	141¼
Orange Free State (all districts)	12¾	16
Grand total	8535½	9423½

5. *Analytical Composition of Guano.*—The average composition of the several stocks of guano disposed of during the year 1921 was as follows:—Phosphoric oxide soluble in water, 3·3 per cent.; phosphoric oxide soluble in 2 per cent citric acid solution, 9·6 per cent.; total phosphoric oxide, 10·0 per cent.; nitrogen, 10·6 per cent.; potash, 2·1 per cent.; lime, 9·9 per cent.

6. *Prospects for* 1922.—The breeding season 1921-22 was a very good one, and the resultant crop would no doubt have exceeded the record established in 1920 but for a repetition of the calamitous happenings already recorded in connection with the previous season. Very heavy and unseasonable rains again visited the Colonial Islands during January and February, 1922, but notwithstanding the losses sustained in consequence thereof it is estimated that the total collections for 1922 will be approximately 9700 tons, or about 750 tons short of the figures for 1920.

7. *Sealing.*—No sealing was undertaken on the south coast during the season 1921, but, as the result of operations carried out on the west coast, 10,129 skins were secured. Of these, 9301 were procured from the islands and rocks off the South-West Africa coast—the largest number yet obtained from those sources in any one season—and the balance, 828, were taken from Elephant Rock.

With the exception of a small consignment of 410 still on hand at the closing date of this report, all skins were shipped to London and disposed of at prices ranging from 8s. to 58s., or an average of 39s. 9½d. per skin, the total amount realized being £19,337.

8. *Seal Oil.*—As there is hardly any demand for this product, and there is still a large unsold stock on hand from previous seasons, very little seal oil was secured in 1921.

9. *Sale of Penguin Eggs.*—The total number of eggs taken by the contractors from Dassen Island during the season 1922 was 535,680, from which a revenue of £3683 was derived.

10 *Revenue and Expenditure.*—The total revenue derived from the sale of guano, seal skins, penguin eggs, etc. (exclusive of gratis issues of guano to other Divisions, valued at £1779), for the financial year 1921-22 amounted to £115,817, and the total expenditure for the same period (excluding free services rendered by other Departments, valued at £116) was £62,283.

Percherons, Glen School of Agriculture.

Report No. XVI.

INSPECTION OF GRAIN.

Chief Inspector of Grain: G. F. NUSSEY.

1. *Exports.*—During the year exports amounted to 4,688,897 bags, consisting of the following:—Maize, 3,295,544 bags; maize meal, 1,282,264 bags; maize grit (rice), 7847 bags; hominy-chop, 42,185 bags; maize flour, 357 bags; kaffir corn, 14,588 bags; oats, 38,299 bags; beans, 109 bags; lucerne seed, 4858 bags; bran, 2870 bags; manna seed, 10 bags.

The year 1921-22 was an exceptionally good one in many respects; the crop was the heaviest yet reaped in any one season, and was uniformly good throughout the Union, as well as in Rhodesia and the adjoining native territories. The total of maize, etc., shipped oversea easily established a record over any preceding year's shipment.

According to Census figures the 1921 harvest yielded 13,347,237 bags, and the consumption for the Union, according to the same source—taken over an average of five years (1914 to 1919)—was stated to be 9,800,000 bags. It will thus be seen that the actual quantity shipped overseas was considerably in excess of the difference between these two figures, and it follows that either the information furnished regarding the actual yield was incorrect or the quantity for local consumption was fixed at too high a figure.

2. *Quality of Maize.*—The quality of the products exported was good. Rejections on account of serious causes amounted to 51,672 bags, of which 31,794 bags were due to dampness, the result in many instances of harvesting the crop before it was in a properly dry condition, and no doubt also to the eagerness of speculators to get early into the market.

A press circular was issued pointing out the danger and loss arising out of railing damp maize for export, and notifying the facilities offered for the testing of maize for moisture content. The latter were taken advantage of, and with a continuance it is anticipated that the railing of damp maize to the ports will in future be greatly diminished. The work in connection with moisture testing, adjudicating on samples as to grade, and the distribution of the various commodities standardized, increases with each succeeding year.

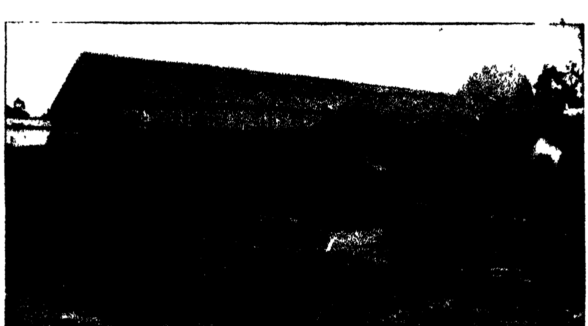
3. *Grading.*—Only one complaint of a serious nature was received in regard to grain shipped from Union ports, and this was in respect of a cargo loaded at Durban consigned to Mauritius. No other complaints were received, and the general opinion is that our grading is consistent and reliable, and our certificates are held in high repute overseas.

4. *Screening Machines.*—In view of the erection of the elevators, certain points in connection with the rough screening machines which are being installed at country elevators were inquired into, more particularly the correct mesh of sieves most suitable for screening. As a result of experiments conducted, Mr. Littlejohn Philip, the engineer in charge of the work, has recommended (and this Division is thoroughly in agreement) that the upper screens through which the maize has to pass, but which keeps back pieces of cobs, sticks, and rubbish larger than the grain, based on present grades, should be as follows:—Screens with oval holes ¾ inch by ½ inch for grades 1, 2, 3, 4, 7, and 8; and ½ inch diameter round holes for grades 5 and 6; the lower screens in both cases to be of ¼ inch diameter round-hole perforations. Anything passing through these screens to be definitely fixed for rejection.

5. *New Grades.*—As a result of the foregoing, the fixing of new grades, to come into operation with the elevator system, was considered. On the instructions of the Secretary for Agriculture a formal conference of representatives of the maize industry was held at Johannesburg, when it was unanimously agreed to accept the grades prepared and proposed by this Division.

The expenditure in connection with this Division for the financial year ended 31st March, 1922, amounted to £7192, whilst the revenue collected over the same period amounted to £11,593.

In view of the Division's coming transfer to the Railways and Harbours Administration, I desire to tender my sincere thanks to those officials of the Department with whom I have been almost in daily contact during the twelve years of my service for their courtesy and assistance.



Report No. XVII.

PUBLICATIONS.

Editor, *Journal of the Department of Agriculture*: G. W. KLERCK.

1. *General.*—The present *Journal* has been published monthly, in English and Afrikaans, since April, 1920. The information it gives is, for the most part, official, and therefore of a nature not otherwise readily accessible to the farmer. It is not designed to be a magazine of light agricultural literature, nor is it meant to share the functions of the excellent agricultural Press of the Union. The *Journal* is the record of the work of the Department and gives its views on current questions.

It is not peculiar to South Africa that the farming community as a whole is not given to reading agricultural literature, but it is, nevertheless, regrettable that so few of our 80,000 farmers have taken the opportunity of keeping in touch with the Department through its chief medium—the *Journal.* Farmers to-day show clearly that they appreciate and need the services of the Department's officers, yet the *Journal*, which contains the considered advice of these officers, and in a country of great distances is one of the chief means of bringing such advice to the door of the farmer, does not at present find its way to every homestead. From a departmental point of view, experience has shown the need of an official publication like the *Journal;* it is an essential apparently in other civilized countries. There are farmers who strive to excel and know that their enterprise is best aided by sedulous study of the department's findings and advice; to such the *Journal* is a prized publication. But a great many, unmindful seemingly of the need that always exists for improving farming methods, neglect a potent means of bettering themselves.

It seems, however, that it is rather with the coming generation of farmers that a greater appreciation of the value of a sound reading habit may be expected. And recognizing the importance of agriculture to the country, it is clear that in the education of those who will eventually take up farming, the *Journal* with its wealth of agricultural information, the result largely of original research under South African conditions, should serve a most useful purpose and be in the hands of all teachers concerned. Judging by the recurring inquiries of school teachers, it seems that many already make use of the *Journal* in their work; were it made available to all its scope and usefulness would be greatly extended. The *Agricultural Gazette of Canada*, for instance, is employed in this manner.

In connection with the circulation figures of the *Journal*, it should be noted that one of the causes of the comparatively small number of subscribers may be found in its free distribution to 3500 crop correspondents, in acknowledgment of their valuable and gratuitous services.

2. *Circulation.*—The number of subscribers to the *Journal* at the 30th June, 1922, was:—English version, 2060; Afrikaans version, 310: total, 2370.

The free mailing list (which in most cases includes also gratis copies of all departmental bulletins published) amounts to:—English, 4754; Afrikaans, 2092; total, 6846.

3. *Revenue and Expenditure.*—The total revenue received during the year ended 30th June, 1922, was £2251, comprised of subscriptions and sales and advertisements in the English edition. Advertisements for the Afrikaans edition have not yet been obtained. The cost of printing the *Journal* during this period (twelve issues) was:—English, £4087; Afrikaans, £1825; total, £5912.

This amounted to 11·7d. per copy for the English, and 23·1d. for the Afrikaans; against this the subscription is 5s. per annum, or 6d. per copy.

4. *Other Publications.*—A large number of departmental bulletins (about 230) covering a wide range of subjects is available to the public, some being priced and the others issued free of charge. The number of bulletins issued during the year amounted to 22,317, and the revenue received for the priced ones was £81. 13s. 1d.

The following bulletins were added to the list during the course of the year:—

No. 2/1921. The Organization and Conduct of Poultry Shows and Clubs.

No. 3/1921. Export of Meat.

No. 4/1921. The Destruction of Rodents.

No. 5/1921. Pruning of Deciduous Fruit Trees.

No. 1/1922. Investigations on Export Citrus Fruit from South Africa during 1921.

No. 2/1922. Pear Scab in the Western Province.

No. 3/1922. Export of Citrus Fruits.

Report No. XVIII.

LIBRARY OF AGRICULTURE.

Librarian: D. S. VAN WARMELO.

THE catalogue of the collection of books in the central library and the various divisional libraries, completed last year, was not printed as intended, the cost being prohibitive. This is a drawback to the lending part of the library. The requirements of the subscribers are, however, partly met by a stencilled list of the more useful works contained in the central library and by a printed table of the more important subjects dealt with in our collection of books; a list of the principal accessions to the library is also published in the *Journal* from time to time.

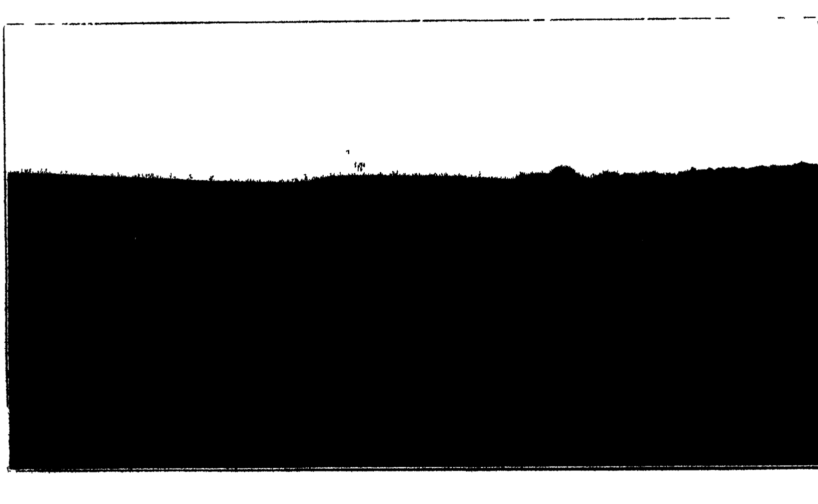
The total number of subscribers was 265, as against 243 the year before, but, as the library is open to the public during office hours, and as many non-subscribers, e.g. civil servants, professors, etc., avail themselves of the opportunity offered, the total number of readers may be put at a conservative estimate of 550.

The accessions to the central library and the Divisions in the form of complete works amounted to over 600, whilst in addition many thousands of serials (journals, reports, annuals, bulletins, etc.), were received in exchange, gratis, or as on standing order.

The library's expenditure on publications during the period under review was £754.

In October, 1921, Mr. Paul Ribbink, who had done much in building up this library, resigned to take up the post of Librarian of the Library of Parliament, Capetown, and was succeeded by the present incumbent on the 21st November.

In March and April, 1922, the Division of Veterinary Education and Research and all the Schools of Agriculture were decentralized from the central library as regards their supply of books. The library is, therefore, no longer the medium through which publications are ordered for these Institutions.



THE DEPARTMENT OF AGRICULTURE.

Abridged List of Staff.

ADMINISTRATION

(Union Buildings, Pretoria).

Secretary for Agriculture	P. J. du Toit.
Under-Secretary for Agriculture	G. N. Williams, D.S.O.
Chief Clerk	F. W. Green.
Accountant	W. H. L. Friedrichs.

DIVISIONS.

Veterinary.

Principal Veterinary Surgeon	J. D. Borthwick. M.R.C.V.S.
Assistant Principal Veterinary Surgeon ...	R. W. Dixon, M.R.C.V.S.
Senior Veterinary Surgeon, Pretoria... ...	F. Hutchinson, M.R.C.V.S.
Senior Veterinary Surgeon, Capetown ...	I. Spreull, F.R.C.V.S.
Senior Veterinary Surgeon, Pietermaritzburg	W. Power, M.R.C.V.S.
Senior Veterinary Surgeon, Bloemfontein ...	A. Grist. M.R.C.V.S.
Senior Veterinary Surgeon, Umtata... ...	G. W. Freer, M.R.C.V.S.

Veterinary Education and Research.

Director of Veterinary Education and Research and Dean of the Faculty of Veterinary Science	Sir Arnold Theiler, K.C.M.G., D.Sc., etc.
Deputy Director of Veterinary Education and Research and Professor of Hygiene and Infectious Diseases	P. J. du Toit, B.A., Ph.D., Dr Med.Vet.
Sub-Director of Veterinary Education and Research and Professor in Biochemistry	H. H. Green, D Sc.
Sub-Director of Veterinary Education and Research and Professor in Applied Research	P. R. Viljoen. Dr.Med Vet.(Berne), M.R.C.V.S.
Senior Research Officer and Professor in Physiology	W. H. Andrews, D.Sc., M.R.C.V.S.
Senior Research Officer and Professor in Veterinary Anatomy	G. v. d. W. de Kock, M.R.C.V.S.
Research Officer and Lecturer in Veterinary Medicine	C. P. Neser, B.A., D.Sc., M.R.C.V.S.
Research Officers	G. A. H. Bedford, F.E.S.; P. J. van Zyl, B.A., Ph.D.: W. W. Henning, M.R.C.V.S.; P. J. J. Fourie. M.R.C.V.S.; M. W. Sheppard, B.Sc.. M.R.C.V.S.; W. Steck, Dr.Med.Vet. (on contract); H. O. Monnig, B.A., Ph.D.

Armoedsvlakte Laboratory.

Officer in Charge	Dr. F. Veglia.

Allerton Laboratory, near Pietermaritzburg.

Officer in Charge	E. M. Robinson, Dr.Med.Vet., M.R.C.V.S.
Research Officer (on contract)	J. Scheuber, Dr.Med.Vet.

Nagana Research Laboratory, near Empangeni, Zululand.

Officer in Charge	H. H. Curson, M.R.C.V.S.

Officers Absent on Special Duty in Europe.

D. T. Mitchell, M.R.C.V.S.; J. B. Quinlan, M.R.C.V.S.; A. O. D. Mogg, B.A.

Sheep and Wool.

Chief	B. G. L. Enslin, D.S.O.
Assistant Chief...	J. F. Jordaan, D.S.O.
Principal Sheep Inspector	W. Y. T. Cronwright.
Principal Sheep Inspector	O. C. Weeber.
Principal Sheep and Wool Expert	A. G. Michaelian.
Senior Sheep and Wool Expert	J. J. McCall, Grahamstown.
Sheep and Wool Expert	L. Visser, Capetown.
Sheep and Wool Expert	D. R. Mellet, Middelburg, Cape.
Sheep and Wool Expert	V. T. Loxton, Durban.
Sheep and Wool Expert	F. Stow, Bloemfontein.
Sheep and Wool Expert	W. S. van Heerden, Potchefstroom.
Sheep and Wool Expert	J. H. Kruger, Pretoria.
Sheep and Wool Expert	T. P. v. d. Walt, Wepener.
Sheep and Wool Expert	A. M. la Grange, Aliwal North.
Sheep and Wool Expert	B. Hartigan, Victoria West.
Sheep and Wool Expert	A. van Zyl, Kimberley.

Entomology.

Chief	C. P. Lounsbury, B.Sc.
Assistant Chief...	Claude Fuller.
Senior Entomologist, Cape	C. W. Mally, M.Sc., F.E.S., Capetown.
Government Entomologist and Plant Inspector, Natal	C. P. v. d. Merwe, Durban.
Government Entomologist and Plant Inspector, Eastern Province	D. Gunn, Port Elizabeth.
Government Entomologist and Plant Inspector, Border	H. K. Munro, B.Sc., East London.
Government Entomologist and Plant Inspector, Transvaal	G. C. Haines, Pretoria.
Chief Locust Officer	R. H. Williams, Pretoria.
Senior Locust Officer	F. L. Thomsen, Pretoria.

Tsetse-Fly Investigation, Empangeni, Zululand.

Assistant Entomologist	R. H. Harris.

Botany and Plant Pathology.

Chief	I. B. Pole Evans, C.M.G., M.A., D.Sc., F.L.S.
Assistant Chief...	E. M. Doidge, M.A., D.Sc., F.L.S.
Senior Botanist	E. P. Phillips, M.A., D.Sc., F.L.S.
Officer in charge Botanical Stations, Pretoria	H. A. Melle, B.A.
Mycologist	Mrs. I. B. Pole Evans, B.A., M.Sc. F.L.S.
Mycologist in charge Cryptogamic Section ...	Miss A. M. Bottomley, B.A.
Agrostologist	Miss S. M. Stent.
Botanist	Miss H. J. Davison, B.A.
Mycologist, Capetown...	V. A. Putterill, M.A.
Mycologist, Durban	(Post Vacant). Since filled.

Dairying.

Superintendent	Ed. O. Challis.
Assistant Superintendent	E. G. Hardy.
Dairy Inspector, Transvaal	(Post Vacant).
Dairy Inspector, Orange Free State... ...	J. L. Veenstra, Bloemfontein.
Dairy Inspector, Orange Free State... ...	B. W. Sutton, Bloemfontein.
Dairy Inspector, Cape...	J. Allison, Capetown.
Dairy Inspector, Cape...	F. Wilkinson, Queenstown.
Dairy Inspector, Natal	J. P. Gow, Pietermaritzburg.
Government Cheese Grader, Cape	S. Groot, Aliwal North.
Government Cheese Grader, East Griqualand	J. F. Stephenson, Kokstad.

Chemistry.

Chief	C. F. Juritz, M.A., D.Sc., F.I.C., Capetown.
Senior Chemist, Pretoria	B. de C. Marchand, B.A., D.Sc., Pretoria.
Senior Chemist, Middelburg, Cape Province	A. Stead, B.Sc., F.C.S.
Assistant Chemist, Pretoria	B. J. Smit, B.A.
Assistant Chemist, Pretoria	D. J. R. van Wyk, B.A.
Assistant Chemist, Pretoria	C. R. v. d. Merwe, B.A.
Assistant Chemist, Capetown...	P. R. Copeman, B.A., B.Sc.

Tobacco and Cotton.

Chief	W. H. Scherffius, M.Sc.
Assistant Chief and Manager, Experiment Station, Rustenburg	J. du P. Oosthuizen, M.Sc. (Ag.), Rustenburg.
Government Cotton Grader	T. G. Hesse.
Manager, Turkish Tobacco Experiment Station, Elsenburg	Pieter Koch, B.Sc. (Ag.), Elsenburg.
Manager, Experiment Station, Piet Retief ...	R. H. Halbert, B.Sc., Piet Retief.
Turkish Tobacco Expert	L. M. Stella, Stellenbosch.
Tobacco and Cotton Expert	R. T. Falgate, Durban.
Tobacco and Cotton Expert	Lloyd Worrall, B.Sc., Barberton.
Tobacco and Cotton Expert	N. L. Mansveldt, Parys.
Tobacco and Cotton Expert	V. F. Olivier, B.Sc. (Ag.), Oudtshoorn.

Horticulture.

Chief	I. Tribolet.
Fruit Inspector, Capetown	H. D. Roworth.
Itinerant Instructor in Horticulture ...	R. E. Nebelung.

Viticulture.

Government Viticulturist	S. W. van Niekerk, Elsenburg.
Manager, Government Wine Farm, Constantia	A. G. van Reenen.
Officer in charge, Paarl Viticultural Station	J. C. van Jaarsveld
Assistant Viticulturist...	A. M. du Plessis.
Laboratory Assistant	G. Frater, B.A.

Co-operation.

Registrar of Co-operative Societies	Johs. Retief
Inspectors	G. R. J. Bodde and E. R. Jacklin.

Agronomy (including Dry Farming).

Government Agronomist	H. S. du Toit.
Manager, Experiment Station, Pietersburg...	H. G. Trollope.

Guano Islands.

Superintendent	W. R. Zeederberg, Capetown.

Grain Inspection.

Chief Inspector of Grain	G. F. Nussey.
Inspector of Grain	F. A. C. Stewien.
Government Grader, Durban...	W. Miles.
Government Grader, Capetown	A. Girton.
Government Grader, Port Elizabeth... ...	J. Murchie.
Government Grader, East London	E. Powell.

"Journal of the Department of Agriculture."

Editor	G. W. Klerck.

Library.

Librarian	D. S. van Warmelo.

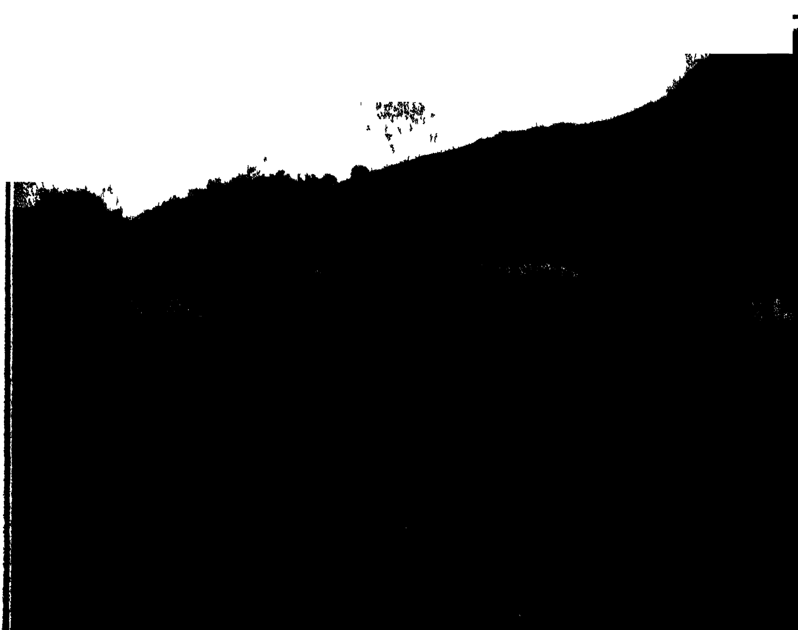
AGRICULTURAL EDUCATION

(Union Buildings, Pretoria).

Under-Secretary for Agriculture (Education)	E. J. Macmillan, B.S.A.
Principal Clerk...	A. H. Harrison, B.A.
Live Stock Officer	C. van Foreest.
Lecturer in Household Science	Miss M. van Duyn
Maize Investigations, etc.	G. J. Bosman, B.S.A
Advisory Officer for Agricultural Settlers .	W. G. Mason, Capetown.

Schools of Agriculture and Experiment Stations.

Grootfontein, Middelburg, Cape (Principal)	R. W. Thornton
Grootfontein, Middelburg, Cape (Vice-Principal)	H. Cooke, B.Sc. (Ag.).
Elsenburg, Muldersvlei, Cape (Principal) ...	W. J. Lamont.
Elsenburg, Muldersvlei, Cape (Vice-Principal)	W. A. K. Morkel, M.Sc.
Potchefstroom, Transvaal (Principal) ...	T. G. W. Reinecke, B.A., M.Sc. (Ag.)
Potchefstroom, Transvaal (Vice-Principal)...	H. v. d. H. Schreuder, Ph.D.
Cedara, Natal (Principal)	J. Fisher, B.Sc. N.D.A.
Glen, Orange Free State (Principal)	M. J. Joubert, B.S.A.
Glen, Orange Free State (Vice-Principal) ...	E. Parish, B.Sc.



Paarl Viticultural Station.

DEPARTMENT OF AGRICULTURE.

Total Number of Officers Comprising the Staff: Year 1922.*

Office.	Administrative and Clerical Division.	General Division.	Temporary.
HEAD OFFICE—	No.	No.	No.
Administration	58	11	—
Divisions—			
Veterinary	74	365 (*a*)	—
Veterinary Education and Research ...	52	67	4
Sheep	11	473 (*b*)	4
Entomology	16	15 (*c*)	—
Botany and Plant Pathology	19	23 (*d*)	2
Dairying	4	9	—
Chemistry	12	7	—
Tobacco and Cotton	5	13	—
Horticulture	1	9	—
Viticulture	2	7	—
Co-operation	8	—	—
Agronomy	3	2	—
Guano Islands	6	30	2
Grain Inspection...	1	6	4
Publications (*e*)	8	2	—
Total	280	1,039	16
AGRICULTURAL EDUCATION.			
HEAD OFFICE	9	2	–
Schools—			
Elsenburg	22	15	–
Grootfontein	27	15	—
Potchefstroom	24	16	—
Cedara	17	10	—
Glen	21	11	—
Total	120	69	—
Training Farms—			
Beginsel	—	5	—
Indwe	—	6	—
Total	—	11	—
GRAND TOTAL ...	400	1,119	16

(*a*) Including Dipping Inspectors. (*b*) Including Sheep Inspectors.
(*c*) Exclusive of Locust Officers. (*d*) Exclusive of 20 Citrus Canker Inspectors.
(*e*) Including the Library.

*Establishment excluding Natives, authorized in Estimates of Expenditure for 1922-1923.

DEPARTMENT OF AGRICULTURE.

Revenue and Expenditure for the Year ended 30th June, 1922.

	Revenue	Expenditure.
AGRICULTURE.	£	£
Administration and General	2,022	45,794
Veterinary	2,031	174,277
Veterinary Research	43,480	95,171
Sheep...	6	250,596
Dairying	1,151	11,094
Botany	1,201	29,120
Tobacco and Cotton...	1,231	13,245
Horticulture...	6,005	8,187
Viticulture	2,048	7,401
Entomology	79	63,347
Chemistry	76	8,315
Publications*	—	4,815
Co-operation...	—	2,962
Agronomy	184	4,027
Guano Islands	99,538	62,283
Grain Inspection	9,662	7,191
TOTAL ... ... £	168,714	787,855
AGRICULTURAL EDUCATION.		
Administration	2,017	19,243
Elsenburg	11,242	29,571
Grootfontein...	8,138	31,232
Cedara	6,512	18,394
Potchefstroom	8,290	26,077
Glen	5,107	21,392
Winklespruit	1,066	—
Beginsel Training Farm	279	4,182
Guba Park Training Farm...	785	4,975
Purchase of Stock	—	2,552
Experiment Stations	—	69
TOTAL ... ... £	43,386	157,687
GRAND TOTAL ... ... £	212,100	945,542

* This sum includes the administrative cost of the *Journal*, the Library, and of the Department's translation work. The cost of printing the *Journal* and the receipts from subscriptions and advertisements are accounted for by the Government Printer. Particulars thereof will be found in Report No. 17, published in this issue.

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TO THE

JOURNAL OF THE DEPARTMENT OF AGRICULTURE.

VOLUME V.—JULY TO DECEMBER, 1922.

[Illustrated articles are indicated by an asterisk.]

AUTHORS' INDEX

TO

VOLUME V OF THE JOURNAL.